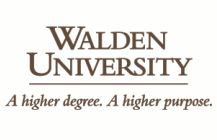

2015

Traumatic Brain Injury and the Impact on Productive Employment

Sunny Okechi Anyalebechi
Walden University

Walden University

College of Social and Behavioral Sciences

This is to certify that the doctoral dissertation by

Sunny Anyalebechi

has been found to be complete and satisfactory in all respects,

and that any and all revisions required by

the review committee have been made.

Review Committee

Dr. Brian Ragsdale, Committee Chairperson, Psychology Faculty

Dr. Nina Nabors, Committee Member, Psychology Faculty

Dr. Abby Harris, University Reviewer, Psychology Faculty

Chief Academic Officer

Eric Riedel, Ph.D.

Walden University

2015

Abstract

Traumatic Brain Injury and the Impact on Productive Employment

by

Sunny Okechi John Uzoma Anyalebechi

MS, Capella University, 2005

ADN, Houston Community College, 1994

MBA, University of Houston, 1981

BBA, Texas Southern University, 1979

Dissertation Submitted in Partial Fulfillment of the

Requirement for the Degree of

Doctor of Philosophy

Clinical Psychology

Walden University

August-2015

Abstract

This study sought to determine how the severity of injury and cause of injury influences engagement in productive work. Using archival research, 1,322 records of adults diagnosed with Traumatic Brain Injury (TBI) were examined for the following variables: engagement in productive employment, job stability, severity of injury, cause of injury, satisfaction with life, and participation activities after TBI. Analysis of variance revealed significant differences in job stability and engagement in productive work between pre-injury and postinjury, which suggests that TBI has an impact on job stability. While no statistically significant differences were found in engagement in productive work among participants with mild, moderate, or severe TBI, there were significant differences in engagement in productive work based on cause of injury. Specifically, the study found that patients with vehicle-related TBI had significantly lower job engagement in productive work when compared with other causes of TBI. In addition, the multiple regression indicated that severity of injury, measured using Glasgow Coma Scale (GCS) score, is a significant predictor of employment outcome when severity of injury is treated as a continuous variable rather than a categorical variable that involves mild, moderate, and severe TBI. This finding suggests that patients with mild TBI may have different employment outcomes based on their GCS score; the case is the same for patients with moderate and severe TBI. Findings from this research have implications for employers, service providers, and policy makers. Employers must understand that TBI reduces employee productivity, which can be increased by focusing on participation activities and life satisfaction efforts. Rehabilitation centers have to focus on community integration efforts and efforts aimed at ensuring that TBI patients secure meaningful employment.

Traumatic Brain Injury and the Impact on Productive Employment

by

Sunny Okechi John Uzoma Anyalebechi

MS, Capella University, 2005

ADN, Houston Community College, 1994

MBA, University of Houston, 1981

BBA, Texas Southern University, 1979

Dissertation Submitted in Partial Fulfillment of the

Requirement for the Degree of

Doctor of Philosophy

Clinical Psychology

Walden University

August-2015

Acknowledgments

There are so many to thank for helping me to complete my dissertation. First, I must thank my God for giving me the perseverance, tenacity, and mental strength to move forward and pursue this dream of completing my PhD in Clinical Psychology, despite many obstacles and challenges.

Secondly, my deepest thanks to my beloved wife, Dr. Victoria N. Anyalebechi, MD, for her patience, sense of humor, and support throughout my doctoral studies and this research. Her undying belief that I would accomplish what I set out to do was vital in my achieving this goal and other goals in my life. My children, Vivian Ijeoma (nee) Anyalebechi Gabisi, Caroline Ifeoma (nee) Anyalebechi Mensah, and Kelechuku Uzoma Sunny Anyalebechi, Jr., have been my rock for ages by their support and assistance throughout the entire duration of my doctoral journey. My late parents, Dr. Vincent Joseph Anyalebechi and Bernadette Ego Anyalebechi, have instilled in me the sense of going to the top in accomplishing my objective in life.

My special thanks are extended to my mentor and dissertation chair Dr. Brian L. Ragsdale and to committee member Dr. Nina A. Nabors for your support, expertise, and guidance throughout this process. The experience you have provided is invaluable, and the knowledge you have so genuinely disseminated has inspired me to strive for excellence in all my research endeavors. Dr. Ragsdale, you helped me mold my topic, encouraged me to stay focused on the topic, and gave me constructive criticism. Thank you for your time, knowledge, and feedback. For that, I am extremely grateful. To Dr. Nabors, you have put the finishing touches on such a distinguished dissertation committee. I am indebted to your knowledge, expertise, and wisdom. I cannot forget to

extend my sincere gratitude to Dr. Abby Harris, Ms. Martha King, Dr. Tobias Ball, Ms. Maria Jaworski, Ms. Sara Matthey, and Dr. John Kaplan,our CAO. I would like to express my sincere gratitude and appreciation to Dr. Chris R. Pretz, Director of the Statistical/Methodological Core, Mr. Dave Mellick, MA, Director Quality Support and Technology Core, and Roshamiliza Rahman and the entire staff of Craig Hospital, the custodian of National Data and Statistical Center for Traumatic Brain Injury Model Systems, who provided me the secondary data set from the archives and also helped me with their guidance in understanding the data set and the codes in the dataset.

I would like to give my profound appreciation to Dr. George P. Grimes and Dr. Bob L. Gant, my clinical directors and internship supervisors. Dr. Grimes, you have been there for me from the Practicum rotation and into the internship period. You have been my pillar of support and reassurance throughout my dissertation project. You have spent such a great amount of time in reviewing some of my chapters and have given me your sincere and cherished criticism. For that, I say thanks for words of encouragement, time, ideas, and hard work to help make my dissertation an exceptional piece of work. You took time to introduce me to other organizations dealing with brain injury candidates.

Table of Contents

List of Tables

List of Figures

Chapter 1: Introduction to the Study

Introduction

Traumatic brain injury (TBI) is a condition that is likely to have a significant impact on one's career and employment (Alderman, Burgess, Knight, & Henman, 2009). This is because TBI results in several emotional, cognitive, and physical changes that hamper the normal resumption to pre-injury duties, such as employment as well as finding new opportunities of employment (Gabella, Mangione, Hedegaard, & Kelly, 2007). The functional outcomes associated with TBI in the long term are becoming increasingly complex, complicated to figure out, and demanding on rehabilitation efforts. According to the Americans with Disabilities Act (ADA) of 1990, TBI is considered a form of disability. The ADA defines disability as a form of mental or physical impairment that considerably hinders at least one major life activity (AMERICANS WITH DISABILITIES ACT OF 1990, AS AMENDED, 1990).It is becoming more clear to well-informed professionals in the TBI subdiscipline that it is an instance of long term disability, and even though substantial advancement has been achieved in relation to community reentry and reintegration of patients with TBI, there is much work needed (Ashman et al., 2008; Gennarelli, Graham, Silver, McAllister,& Yudofsky, 2009).

The outcomes of sequelae following TBI, which include sensory and physical disabilities, psychosocial functioning impairments, and cognitive deficits, are usually negative for employment outcomes (Ashman et al., 2008). Researchers have indicated that persons with TBI usually have difficulties in resuming and securing competitive

employment during the postinjury period. In addition, some researchers pointed out that persons with TBI have challenges in maintaining employment (Bhatia & Gupta, 2007). The employment rate for individuals suffering from TBI ranges between approximately 20% and50% and varies in accordance with the severity of the TBI, pre-injury work experience, and various demographic factors, such as socioeconomic status, education, and age (Bjork & Grant, 2009). Several descriptive and empirical studies have also reported numerous negative psychosocial outcomes associated with the unemployment of persons having TBI, which include reduced social functioning, physical illnesses, and depression (Assa & Pasternak, 2008; Bennett, Lesch,& Heils, 2008; Bhullar, Roberts, Brown,& Lipei, 2010). Furthermore, there are cases associated with financial difficulties, lost wages, amplified economic burdens for the society and families having individuals suffering from TBI, and reliance on assistance from the public (Chaytor et al., 2007). According to Ashman et al.(2008), because of the sequelae following TBI, employment often becomes challenging and unlikely because of the resulting psychosocial, cognitive, and physical problems. It is evident that meaningful employment plays an integral role in enhancing self-esteem, quality of life, and financial status; however, for many people suffering from TBI, returning to productive employment seems improbable (Hoge, Auchterloine,& Milliken, 2006). In addition, a vocational comeback to work is increasingly perceived as a way of improving physical, behavioral, and cognitive recovery after the acute rehabilitation phase of TBI (Assa & Pasternak, 2008).

Despite the fact that most individuals with TBI are motivated to resume work, reentering or finding new employment can be hard (Gondusky & Reiter, 2008). Researchers have not provided specific details regarding the long term income loss and the level of public assistance needed by persons suffering from TBI (Assa & Pasternak, 2008; Bhatia & Gupta, 2007). Predicting employability after TBI is essential because of the need to ensure the outcome of rehabilitation efforts and employment outcomes after TBI. Predicting employability following TBI is a challenging process due to the several variables affecting productivity employment outcomes. In the recent past, researchers have emphasized neurobehavioral problems after the occurrence of TBI (Arciniegas, 2009). According to Gondusky and Reiter (2008), neurobehavioral problems are defined as "a person's capability to process thoughts, manage emotions, communicate, and conduct oneself socially" (p. 125). People with neurobehavioral problems usually experience trouble when concentrating, memorizing events and things, and coordinating activities (Gennarelli et al., 2009). Furthermore, TBI has been established to reduce self-awareness, which implies that impaired individuals lack the capability of accurately assessing their level of function (Assa & Pasternak, 2008).Some factors affecting employability after TBI include educational levels, cases of substance abuse, demographic factors, disability resulting from other injuries, and other factors; however, this study addressed the relationship existing between TBI and employment outcomes, particularly the impact that TBI has on engagement in productive employment during the postinjury period.

To determine the relationship between employment outcomes and TBI, I considered the various factors describing TBI, such as severity, functional status, and cause of TBI, and their resulting impacts on variables that are likely to affect employment outcomes (Hoge et al., 2006). Examples of such variables affecting engagement in productive work include severity of injury and cause of injury (Zanier, Ortolano, Ghisoni, Colombo,& Losappio, 2007).As a result, my goal of this study was to determine the link existing between the commencement of traumatic brain injury and engagement in productive work, particularly with regard to the identified variables known to affect employment outcomes of people suffering from TBI. In the study, I compared participants' employment status (participation in productive work) as grouped by cause and severity of injury (Hou et al., 2007).

Statement of Problem

It is apparent that TBI is a life-changing event that influences the employee's life. Current policies stipulate that an employee may be entitled to accommodations when TBI results in impairment of key life activities as well as employment. The Americans with Disabilities Act of 1990 considers TBI a form of disability, and employers have the obligation of accommodating employees with disabilities, including TBI(AMERICANS WITH DISABILITIES ACT OF 1990, AS AMENDED, 1990). Furthermore, meaningful work helps in establishing a sense of meaningfulness and social connection; as a result, employers must have a better understanding of the TBI implications on employment, particularly with regard to the extent to which people with TBI engage in productive

work (Assa & Pasternak, 2008). Similarly, individuals suffering from TBI must have an understanding of their employability prior to seeking employment. In this regard, this study provided a lens through which employers could evaluate the decision whether to employ individuals who have suffered TBI. This study will also be helpful in ascertaining the employability of individuals with TBI during the postinjury period.

Purpose of the Study

The purpose of this study was to determine the relationship between the onset of TBI and the impact on employment outcome, particularly the impact of TBI on engaging in productive work. To achieve the purpose of the study, comparison of the extent to which participants take part in productive work was evaluated for postinjury data. Achieving the research purpose required the use of the following research objectives:

1. To determine the relationship between injury severity and engagement in productive work.
2. To determine how the cause of injury is related to engagement in productive work.
3. To determine how the satisfaction with life after TBI is related to engagement in productive work.
4. To determine how participation activities after TBI are related to engagement in productive work.

Research Questions and Hypotheses

To achieve the aforementioned research objectives, the following research questions were used:

RQ1. What is the nature of the relationship between severity of TBI and engagement in productive work?

***H*1$_0$:** Severity of TBI negatively affects engagement in productive work.

RQ2. What is the nature of the relationship between cause of injury and engagement in productive work?

***H*2$_0$:**The cause of injury has an impact (fall related TBI, motor vehicle accidents, struck by/against events, industrial and work-related accidents, and assaults) on engagement in productive work after TBI.

RQ3. What is the nature of the relationship between satisfaction with life after TBI and engagement in productive work?

***H*3$_0$:** Satisfaction with life increases engagement in productive work after TBI.

RQ4. What is the nature of the relationship between participation activities and engaging in productive work after TBI?

***H*4$_0$:** Engaging in participation activities increases engagement in productive work.

Nature of the Study

This study entailed the analysis of the extent to which TBI patients engage in productive work to determine the relationship between TBI and employment outcomes.

As a result, I used a quantitative method to determine any statistically significant associations that couldbe derived between the dependent and the independent variables in this study. The dependent variable in this study was engagement in productive work, whereas the independent variables were severity of injury and cause of injury. Data were collected from leading TBI support providers in the Southwest region of the United States.

Significance of the Study

This research is extremely important to various individuals, such as employers, patients suffering from TBI, students, and caregivers to the patients. The first significance of the study is that it will assist employers in deciding whether to employ individuals suffering from TBI. In this study, I evaluated the interplay between TBI and engagement in productive work; therefore, the study provided important insights to employers regarding the implications of employing individuals who have suffered TBI since engagement in productive work is directly tied to performance. Through the findings presented in this study, employers may opt not to employ people suffering from TBI or come up with assistive measures that can help improve participation in productive work. In addition, the findings of this study will help patients suffering from TBI have an understanding of their employability; this insight can guide TBI patients with regards to the kinds of work they can resume and those they cannot resume during the postinjury period.

Assumptions and Limitations

Numerous assumptions were relevant in the context of this research problem. First, from the sample selection, I assumed that the selected sample was representative of the entire population from which the study made inferences. The inferences and statistical analysis from the selected sample were representative of the people who have experienced TBI, particularly with regard to those who are employed and have once experienced TBI. The second assumption was that engagement in productive work is absolutely determined by the emotional, physical, and cognitive abilities of an individual, which are subject to be affected in the event of TBI.

The nature and design of the study present numerous limitations. First, the study is correlational in nature, which implies that, whereas the findings of the study are likely to indicate a relationship existing between two variables, there is not any absolute proof that one variable results in change of another variable. The underlying fact is that correlation does not suggest causation. In the context of this study, it is evident that other uncontrolled factors are likely to influence the outcome. For instance, other factors likely to influence the likelihood of engaging in productive work include the work environment, interrelationships with workmates, and the nature of the task, which are not accounted for in this study.

Scope and Delimitations

In this study, I only used participants who were in employment or were in employment during their TBI (postinjury employment). Lack of pre-injury employment

was not considered for this study. As a result, the findings presented in this study were only generalizable to individuals in postinjury employment.

Definitions of Theoretical Constructs

Definitions of theoretical constructs play an integral role in offering the meaning of a word with respect to the theories used in a particular discipline (Vas, Chapman, Cook, Elliott, & Keebler, 2011). A definition of theoretical constructs makes an assumption of acceptance and knowledge of the theories on which it relies. Defining a theoretical construct has the goal of establishing a hypothetical construct and helps in specifying particular situations where the word should be utilized (Jagoda, Bazarian, & Bruns, 2009). In the context of this study, the definitions of theoretical constructs included engagement in productive work/employment status (the dependent variable) and the severity of injury and cause of injury(independent variables).

*Cause of Injury***:** Cause of injury refers to a categorization scheme based on the causes of a head injury (Maas, Hukkelhoven, Marshal, & Steyerberg, 2005). The scheme offers essential insight with respect to the relationship between the affected brain parts and the expected outcome. The determination of the extent of injury and the expected outcome can be achieved by assessing the forces and the corresponding levels. The analysis of the forces enables mental health professionals to classify the causes of injury (Maas et al., 2005). The physical classification or forces can also lead to determining whether the brain experienced some motions inside the skull. The most common

classifications include impact or inertial loading. This implies that the analysis of the forces on the head can lead to the prediction of the TBI outcome.

According to Maas et al. (2005), the main causes of TBI include falls, automobile accidents, being struck by or against events, physical attack or assaults, pedal cycles that are nonmotorized, transport, and suicide. Fall-related TBIs account for 28% of TBI in the United States and are most prevalent among children of 4 years and below and adults aged over 75 years. Motor vehicle accidents account for 20% of TBIs in the United States and are most prevalent among individuals between 15 and19 years of age (Bhatia & Gupta, 2007). Struck by/against events entails TBI caused by collision with a stationary or moving object and accounts for about 19% of TBIs in the United States. Assaults resulting from firearms account for 11% of TBIs in the United States. Ninety percent of patients suffering from assault-related TBIs die (Brain Trauma Foundation, 2007). Nonmotorized pedal cycles such as tricycles and bicycles are also known to inflict TBIs and account for 3% of TBIs in the United States (Bhatia & Gupta, 2007; Brain Trauma Foundation, 2007). Other causes of TBI include suicide, industrial and work-related TBI, and domestic violence. For this study, the causes of TBI considered included falls, automobile accidents, being struck by or against events, physical attack or assaults, pedal cycles that are nonmotorized, transport, and suicide (Bazarian et al., 2007; Bercaw, Hanks, Millis, &Gola, 2011; Lewis, 2009).

*Severity of injury***:** The taxonomy of the TBI in accordance with the severity of the TBI is perhaps the most used model of classification (Rutter & Silberg, 2010). Based on

the severity, TBI can be grouped into mild, moderate, and severe. The Glasgow Coma Scale (GCS), which assesses the level of consciousness of an individual on a scale of 3 to 15 that draws upon eye-opening, verbal, and motor reactions to environmental stimuli, is the most widely deployed approach for classifying TBI based on the severity. (Kirkness & Thompson, 2009). Based on clinical indices developed in the different models, diagnosis and the eventual treatment or therapy advanced to the patient is based on the severity of the head injury. Such a severity draws upon different criteria employed by different TBI specialists (Tagliaferri, Compagnone, & Korsic, 2008). The most widespread taxonomy of TBI on the severity is the GCS. The GCS system uses 15 points, and the model estimates the severity of the head injury based on adults (Kirkness, Burr, Cain, Newell, & Mitchell, 2008). For instance, a score of 8 or less is considered a severe case of head injury (Tariot, Loy, & Ryan, 2009).

Summary

In this chapter, I gave an overview of the problem statement, operational definitions, the purpose of the study, research questions, directional hypotheses, significance of the study, and a brief literature review. The purpose of this study was to determine the impact of TBI in engagement on productive work. The dependent variable was engagement in productive work, whereas independent variables were derived from the characteristics describing the population, which includes people with TBI. These people with TBI are described in terms of the severity of injury and the cause of injury. In the following chapter, I review empirical and theoretical literature regarding the link

between TBI and participation in productive work (employment status). Chapter 2 addresses literature relating to the relationship between TBI and employment outcomes, including symptoms of TBI known to affect employment outcomes, the neuropsychological evaluation of TBI, implications for employment for individuals suffering from TBI, and the employment related outcomes after TBI concerning productive work and return to work after TBI. Chapter 3 provides a description of the research methodology used in this study, including data source, participants, research design, sampling plan, instrumentation, ethical issues, data analysis, and threats to validity. Chapter 4 indicates the results of the study, including the descriptive and inferential statistics. In Chapter 5, I conclude the research by presenting the interpretation of findings, implications of findings, recommendations for future research, and limitations associated with the research.

Chapter 2: Literature Review

Introduction

The purpose of this study was to determine the relationship between the onset of TBI and the impact on employment outcome, particularly engagement in productive work after TBI. In the recent past, researchers have emphasized neurobehavioral problems after the occurrence of TBI (Arciniegas, 2009). Neurobehavioral problems are defined as "a person's capability to process thoughts, manage emotions, communicate, and conduct oneself socially" (Gondusky & Reiter, 2008, p. 145). People with neurobehavioral problems usually experience trouble when concentrating, memorizing events and things, and coordinating activities (Gennarelli et al., 2009). Furthermore, TBI has been established to result in a reduction of self-awareness, which implies that impacted individuals lack the capability of accurately assessing their level of function (Assa & Pasternak, 2008). Some factors affecting employability after TBI include educational levels, cases of substance abuse, demographic factors, disability resulting from other injuries, and other factors; however, in this study, I focused on the relationship existing between TBI and employment outcomes, particularly the impact that TBI has on engagement in productive work during the postinjury period. The chapter commences with symptoms of TBI known to affect employment outcomes, which included behavioral, cognitive, and emotional symptoms. The chapter also addresses the neuropsychological evaluation of TBI, implications for employment for individuals

suffering from TBI, and employment related outcomes after TBI concerning productive work and return to work after TBI.

TBI is a significant public health issue in the United States. TBI contributes to several causes of death and permanent disability (Arango-Lasprilla, Ketchum,& Williams, 2008). In the United States alone, recent data indicated that about 1.7 million people suffer from TBI annually (Bhullar et al., 2010). TBI is an acquired brain injury that comes about when a spontaneous trauma, such as an external mechanical force, results in brain damage (Alderman et al., 2009; Arango-Lasprilla et al., 2008; Ashman et al., 2008). Examples of external mechanical forces that are likely to cause brain damage and TBI include swift deceleration or acceleration, projectile penetration, and blast waves (Hudak et al., 2011). TBI is a type of acquired brain injury that occurs after birth, whereas the other type of TBI is a nontraumatic brain injury that does not entail external mechanical forces (Powell, Parker, Alexander, Symms,& Boulby, 2008). It is apparent that all forms of TBIs are head injuries; however, nontraumatic brain injury may also be used to refer to other injuries affecting other regions of the cranium. Nevertheless, the terms *brain injury* and *head injury* can be used interchangeably (Alderman et al., 2009). In addition, brain injuries are classified under neurotrauma and central nervous system injuries (Ashman et al., 2008; Chaytor et al., 2007; Gabella et al., 2007). In most cases, head injury denotes TBI; however, it is a broader classification because it can encompass damage to other structures in the head besides the brain, such as the skull and scalp. TBI is a principal cause of disability and death at the global level, particularly in young adults

and children (Hudak et al., 2011). TBI can result in behavioral, emotional, social, cognitive, and physical consequences, with outcomes ranging from total recovery to death or unending disability, all of which have an impact on one's postinjury life, including employment (Alderman et al., 2009). It is apparent that this range of outcomes tends to affect the individual productivity of a person suffering from TBI. In light of this view, several studies have been conducted to assess employment outcomes after TBI in terms of engagement in meaningful and productive work and return to work after TBI (Arango-Lasprilla et al., 2007). The goal of this chapter is to review current empirical studies and literature regarding the relationship existing between TBI and engagement in productive work.

Based on the conceptual model for this study as well as practical considerations, a literature search strategy was developed, which included exclusion and inclusion criteria to help in the identification of relevant articles, search strategies to help in the retrieval of articles, protocols for abstract review, and a scoring system for published articles to evaluate their completeness. Regarding the exclusion and inclusion criteria, the article had to address any aspect of TBI, including causes, severity, measurement, and impacts on employment outcomes. Primary studies as well as meta-analysis reviews were considered. Articles published before 2000 were excluded except when they were seminal works. Regarding the search strategy, the goal was to identify published articles as well as ongoing research with respect to TBI. For the literature review, the standard search strategies were deployed, including online databases search (Medline, Pub Med)

using key words such as *traumatic brain injury, impact of traumatic brain injury on employment outcomes, causes of traumatic injury,* and *severity of traumatic injury* and websites of related organizations, such as those providing rehabilitation services to TBI patients.

Productive Work

Engagement in productive work has significant impacts on employee performance. Empirical evidence suggests a positive relationship between employee engagement in productive work and organizational performance-based outcomes. In attempting to define productive work, Jiang, Feng, and Fu (2007) asserted that engagement in productive work could be perceived as a continuum involving burnout on one end and engagement in the other end of the spectrum. In addition, employees are positioned at some point in this continuum at a particular point in time. Burnout refers to a psychological syndrome typified by inefficacy, cynicism, and exhaustion resulting from chronic work stressors. Burnout is characterized by low efficacy, low involvement, and low energy, whereas engagement is characterized by high efficacy, high involvement, and high energy at work. A number of researchers have explored the factors that influence engagement in productive work; these factors include the work environment and leader empowering behavior(Arango-Lasprilla et al., 2007, 2008). For Bandura (1997), engagement in productive work refers to a positive and fulfilling work-related state of mind typified by absorption, dedication, and vigor. Instead of being a specific and temporary state of mind, engagement in productive work entails a more pervasive and

continual affective-cognitive state that is not directed at a specific behavior, individual, event, or object. Vigor is typified by high mental resilience and energy while performing work-related duties as well as persistence. Dedication is typified by strong involvement in work-related tasks as well as experiencing enthusiasm, challenge, pride and inspiration. Lastly, absorption is typified by a person being happily engrossed and exhibiting high concentration levels in his/her work-related tasks (Bandura, 1997).

Productivity at the workplace has also been linked to people's self-efficacy. With respect to the cognitive, physical, and emotional sequelae associated with the onset of TBI, it is imperative to evaluate the concept of productive work in the light of the theory of self-efficacy. According to Bandura (1997), employment-related self-efficacy measures the confidence of an individual with regard to the execution of actions while managing numerous situations, particularly while managing work-related experiences. The theoretical definition underpinning work-related self-efficacy is that individuals having high employment-related self-efficacy tend to be more successful in terms of workplace performance (Arango-Lasprilla et al., 2007,2008). In addition, belief in work accomplishments tends to increase employment-related self-efficacy because of the feedback loop that links the ensuing work performance to augmented self-efficacy beliefs. In the context of the social learning theory, Bandura defined self-efficacy as "a person's belief that he/she is able of executing a specific task successfully" (p. 129). As a result, Bandura considered self-efficacy a task-specific form of self-esteem or self-confidence. This theoretical definition implies that self-efficacy comprises three

dimensions, namely “magnitude, strength, and generality” (Arango-Lasprilla et al., 2008, p. 869). Magnitude refers to the degree of task complexity that people believe they can achieve, whereas strength defines the conviction about the magnitude as either weak or strong (Bandura, 1997). On the other hand, generality defines the level to which the person generalizes his/her expectations in a myriad of situations. The sense of capability of an employee determines his/her performance, motivation, and perception. People seldom try to perform such a task that they are likely to be unsuccessful (Bandura, 1997).

Brain Injury

Understanding the relationship between TBI and employment outcomes requires the understanding of how brain injuries affect the brain, which in turn has an effect on other variables such as productivity (Ashman et al., 2008). In TBI, the injury may either occur in a specific part of the brain or be diffused to various parts within the brain; therefore, the functional impairment depends significantly on the specific part of the brain that is damaged (McAllister, 2008). Because of this indefinite nature of TBI, the treatment is usually distinctive for every individual patient. In the last 2decades, scientific research has made substantial contribution towards understanding the anatomy of the brain and brain function (Alderman et al., 2009). The brain is comprised of several nerve cells that control how humans think, move, and feel; as a result, knowledge of the function and structure of the brain is helpful in understanding the outcomes of brain injury, which are directly related to individual self-efficacy.

The nervous system acts as the communication and decision center of the human body (Bouwens et al., 2008). Damage to the brain is likely to impair the functionality of the brain taken as a whole and those of its respective components (Arango-Lasprilla et al., 2008). The two components of the brain associated with aggression include the cerebral cortex and the limbic system. Numerous experimental studies have affirmed that injury in these specific brain areas can result in aggressive behavior (Walker, Cole, Logan & Corrigan, 2007; Winqvist et al., 2008; Zanier et al., 2007). Because of the association between inhibitions and rational thinking and the cerebral cortex and limbic system, damages in these areas are expected to have an impact on an individual's behavior (Winqvist et al., 2008). Empirical studies have revealed that brain dysfunction can lead to violent behavior (Rogers & Read, 2007).Nevertheless, other factors, such as genetic, social, and environmental variables, can also result in violent behavior (Arciniegas et al., 2009).

Symptoms of TBI Known to Affect Employment Outcome

TBI has an effect on the manner in which people feel, act, and think; as a result, these impairments are likely to hinder persons suffering from TBI from finding and keeping a job (Arango-Lasprilla et al., 2008; Gennarell et al., 2009). The problems of TBI can be cognitive, behavioral, or emotional, all of which are related to employment outcomes. Cognitive problems include problems with attention, memory, solving problems, decision-making, and communication, whereas behavioral problems can include problems with starting tasks (initiation), difficulty in establishing and maintaining

the proper social behavior in certain social situations, and impulsivity (Arango-Lasprilla et al., 2007; Ashman et al., 2008; Bouwens et al., 2008; Smits, Dippel,& Steyerberg, 2007). Emotional problems after TBI can entail problems with regulating anxiety and anger and susceptibility to depression, which is likely to have a negative effect on interpersonal relationships at the workplace (Czarnik, Gawda, Latk, Kolodziej,& Sznajd-Weron, 2007). The long lasting effects of TBI vary among different people and the severity of the brain injury. At present, TBI is referred to as the silent epidemic in several communities around the world (Terrio, Brenner,& Ivins, 2009). In terms of cognitive consequences, TBI is known to affect executive functions of the brain, such as perception and the chemical processes involved in making decisions and reasoning (Corrigan & Bogner, 2007; Mainio et al., 2007). Brain injuries often affect memories, short term and long term, as well as the language and communication capabilities of the patient. A study by Kim et al. (2007) indicated that 26% of all TBI patients have exhibited inhibited cognitive capabilities after a traumatic head injury. Moreover, of these, about 35% eventually die, and about 5% remain vegetative (Kim et al., 2007).The remainder suffers lifelong disabilities, such as paralysis or other forms of impairment like deafness, blindness, or total memory loss.

Similarly, severe psychiatric sequelae of brain injury may be experienced (Arciniegas et al., 2009). Some preexisting genetic combinations provide good conditions for psychiatric consequences to occur soon after a brain injury (Starkstein & Jorge, 2008). Different researchers have indicated that, with the existence of some particular

gene combination, a brain injury may spark a psychiatric condition that had not existed before (Jang et al., 2009; Kennedy et al., 2007; Wise et al., 2010). The patient soon exhibits delirium, confusion, disorientation, and agitations, though considered to be of sound brain functioning (Bouwens et al., 2008).

Behavioral Symptoms

Individuals suffering from TBI might experience behavioral changes depending on which parts of the brain sustained injuries (Armonda et al., 2006). For instance, severe injuries on the frontal lobe, which control impulsivity and personality, might result in lack of self-control. According to various behavioral studies undertaken by Armonda et al. (2006) and Alderman et al. (2009), TBI patients do not have the capability of controlling and regulating their anger or aggression. In addition, these researchers pointed out that patients might inappropriately comment to strangers or friends without realizing that their comments are out of context.

Substance abuse is one of the behavioral symptoms witnessed among TBI patients. According to psychological studies, substance abuse is the common problem among individuals suffering from TBI (Starkstein & Jorge, 2008). Some patients resolve to abuse drugs as a way of dealing with depression, pain, or anxiety. However, the abused substance ultimately hampers the patient's recovery or further complicates the problem. Substance abuse has been shown to have a detrimental effect on employment outcome. Alderman et al. (2009) reportedthat TBI patients who resort to drug abuse often have difficulties in finding and keeping a job.

Another symptom of the TBI that is likely to have an effect on employment outcome is the impairment of executive functioning (Zanier et al., 2007). Such impairment can affect both the sense of insight and judgment (Zanier et al., 2007). Bhatia and Gupta (2007) strongly affirmed that when the ability to make sound decisions is interfered with, it exposes TBI patients to the influence of family and friends (Bhatia & Gupta, 2007). The inability to make sound judgments by patients suffering from TBI has always been cited as the main reason why employers cannot employ individuals who have suffered from TBI; this is common, especially for employees who hold positions that require sound decision-making, such as operating machines (Armonda et al., 2006; Winqvist et al., 2008; Wise et al., 2010).As a result, individuals suffering from the disorder can experience peer influence, which can come with both negative and positive impacts. Substance abuse is one of the behaviors that spread due to peer pressure and the inability to make sound decisions and judgments following TBI (Bouwens et al., 2008). In relation to employment outcome, substance abuse can lead to irresponsibility among employees suffering from TBI (Warden, 2008).

Impulsive and inappropriate behavior is another symptom of TBI that is likely to have an impact on employment outcome (Alderman et al., 2009). Impulsive behavior refers to a behavior acted on by a person before thinking about it (Corrigan &Bogner, 2007). Impulsive or inappropriate behavior results from injuries sustained in the focal frontal lobe (Wang et al., 2008).Patients or survivors of brain injuries frequently tend to do disturbing, embarrassing, or annoying behavior (Walker et al, 2007). Moreover, TBI

patients might often break rules at workplace environments. Intriguingly, these patients or survivors do not understand their non-conformity to the law or proper conduct (Bhullar et al., 2010; Walker et al., 2007). Other observations have also indicated that the patients might also break rules or opt not to conform to the ethical codes of conduct due to their own ignorance (Walker & Pickett, 2007).

Increased agitation is an obvious symptom after TBI, which is also likely to have a negative impact on employment outcomes, especially with regard to interpersonal relationships within the workplace (Vassallo, Proctor-Weber, Lebowitz, Curtiss,&Vanderploeg, 2007; Vas et al., 2011). TBIs might destroy discriminating abilities, making the patient unable to filter out environmental stimuli (Bjork & Grant, 2009; Vakil, 2008). Because of impaired cognitions, such patients cannot perceive the necessity of certain activities. Additionally, the memory lapses of TBI patients cause them to forget within a very short time. With regard to employment outcome, increased irritability among these patients might increase cases of conflict among workmates (Bouwens et al., 2008; Brain Trauma Foundation, 2007; Hoge et al., 2006).

According to McAllister (2008), some TBI patients might show both physical and verbal outbursts. People suffering from traumatic head injury will frequently utter words that they will admittedly feel sorry for. The patients might proceed to repeat this behavior, no matter how bad they feel every time it happens (Brain Trauma Foundation, 2007). Some behavioral studies related to head injuries indicate that the outbursts might be physical instead of psychological (Armonda et al., 2006). Such situations may appear

very explosive; however, they might not be necessarily so. In relation to employment outcome, verbal and physical outbursts might interfere with the interpersonal skills of a worker in that fellow workmates might tend to ignore individuals suffering from TBI (Bruns & Hauser, 2008; Chang et al., 2009; Jellinger, 2010).

All patients suffering from TBI also display high levels of egocentrism (Menon, Schwab, Wright,& Maas, 2010). Situational, psychological, and organic factors are the key causative factors of egocentrism. Damage to the frontal lobes of the brain also causes egocentrism (SAFE Study Investigators, 2007). With regard to the situation, the rehabilitation method, either chronic or acute, might advance egocentrism. For example, a family member who does not contribute to the household setting unless it relates to him / her might be directly suffering from egocentrism (Cardoso, Romero, Chan, Dutta,& Rahimi, 2007; Ponsford, Whelan-Goodinson,& Bahar-Fuchs, 2007;Tsuang et al., 2004). In addition, patients suffering from egocentrism might compete with other family members to seek attention. Egocentrism might also interfere with an individual's productivity. Egocentric workers will always consider themselves; hence, they will participate in productivity on condition that they benefit (Walker et al., 2007).

According to Terrioet al. (2009), head injury patients display suspiciousness or paranoia, and TBI patients are not an exception. The feeling that somebody is "watching over them" is common among these patients (Terrio et al., 2009). Nevertheless, this feeling does not have factual basis and can result in problems in domestic situations. For instance, such a patient might frequently have the feeling that another family member is

secretly talking about him or her (Chaytor et al., 2007). The suspiciousness characteristic emerges from the incapability to figure out a situation and make sound conclusions about what is going on (Alderman et al., 2009). The feeling of suspiciousness among TBI patients might lead to false accusations at the workplace that, in turn, result in conflicts (Felicetti, 2009).

Cognitive Symptoms

Different types of head injuries have different impacts on the cognitive abilities of the patient. Studies have indicated that the impact and the consequences of the brain injury depend on the severity of the brain injury (Corrigan & Bogner, 2007; Fann, Burington,& Leonetti, 2008; Jagoda, Bazarian,& Bruns, 2009). In most cases, the cognitive sequelae of brain damage may be displayed in terms of impaired efficiency in the manner in which the patient processes information. The patient appears less alert or attentive and with poor attention span and vigilance (Tsuang et al., 2004). The patient also appears inhibited, apathetic, and extremely dull. All these characteristics make the patient appear less motivated in almost every aspect (Iverson, 2010). Therefore, the cognitive sequelae of brain damage can be discussed in three tenets, namely executive functioning, memory loss (amnesia), and difficulty with language and communication (Clark et al., 2008).

Cognitive functioning.TBI impacts measured intelligence. Both the performance and verbal intelligence quotient (performance and verbal IQ) are affected in patients who have suffered chronic and acute TBI (Jagoda et al., 2009; Schwab, Ivins,& Cramer,

2007). Evidence of reduced performance IQ has been seen in patients even three years following the experience (Eslinger, Zappala, Chakara,& Barrett, 2007). These patients no longer perform previous functions that they would adequately perform before TBI (Arango-Lasprilla et al., 2007; Arciniegaset al., 2009; Czarnik, Gawda, Latk, Kolodziej,& Sznajd-Weron, 2007). Schwab et al. (2007) illustrated that some degree of hydrocephalus is exhibited by patients who have experienced chronic TBI or have lived through a prolonged coma. Hydrocephalus has been associated with progressive intellectual degradation, wherein patients cannot learn new things and forget the facts that they knew before the incident (Maas et al., 2007; Schwabet al., 2007).

There are also predisposing factors that influence the development of reduced intellectual abilities. Multiplicity of head traumas is one of the factors that may lead to eventual intellectual deterioration (Gennarelli et al., 2009). Other factors comprise the severity of the head injury age (especially patients beyond the age of 60), alcoholism, and atherosclerosis (Hoge et al., 2006).

A second impact that brain injury has on executive functioning of the brain is perception (Jellinger, 2010). Different types of TBI have been associated with different cases of inhibited perception. For instance, injuries to the frontal lobe have been associated with visual-perceptual disturbances (Mathias & Wheaton, 2007). With regard to this, patients have difficulties in figure-ground perception and take much longer to construct images (Armonda, et al., 2006; Czarnik et al., 2007). Other forms of perception such as hearing, may be impaired depending on the type of brain injury. This form of

cognitive sequelae has been extensively used in determining the extent of a TBI as a form of measurement. For instance, the Glasgow Coma Scale relies on the use of perception to evaluate the extent of a brain injury. In most cases, reduced perception by the patient points to the possibility that the patient may have suffered extensive brain damage (Maas et al., 2005).

Memory. One consequence that has largely been associated with TBI is memory loss. In general, patients who have undergone severe physical trauma to the head have exhibited different levels of memory loss (amnesia) (Deb & Burns, 2007; Draper, Ponsford, & Schönberger, 2007; Hou et al., 2007). Terrioet al. (2009) asserted that amnesia could be classified into two broad categories: anterior grade and retro grade amnesia. Retro grade amnesia is the loss of memory held before suffering from the head injury (Terrio et al., 2009). It is the most common type of amnesia associated with head injuries. Some patients may lose about an hour or a few minutes of memory before the head trauma, while others may lose longer periods, such as years (Terrio et al., 2009). The difference in the extent of memory loss depends of several factors. Lehtonen, Stringer, and Millis (2007) reported that some specific etiological factors such as alcoholism, might determine the extent of the amnesia. Nevertheless, with time and under structured therapy, a significant number of patients have been found to recover most of their memories (Ding et al., 2008).

The second kind of amnesia, referred to as anterior grade amnesia, is associated with memory loss after the head trauma (Staudenmayer, Diaz-Arrastia, Oliveira,

Gentilello,& Shafi, 2007). With respect to this, patients forget things after the accident (German Society for Trauma Surgery, 2008; Sherer, Struchen, Yablon, Wang, & Nick, 2008). For instance, a patient keeps on forgetting the attending doctor or anything learned after the head trauma. Other patients have been found to forget their stay in hospital. This kind of memory loss can be traced back to altered chemical balance in the brain following the injury (Ashman et al., 2008). The severity of the head injury plays a key role in determining the extent to which a patient suffers anterior grade amnesia (Hart, Whyte,& Millis, 2006). Chronic head trauma may lead to permanent inability to remember new things (Rogers & Read, 2007; Ruff, 2008;Rutter & Silberg, 2010).

Language. Inhibited communication is also one of the consequences synonymous with TBI (Elaine, Le Blanc,& Feyz, 2008; Kirkness & Thompson, 2009). Similar to other varieties of cognitive sequelae, inhibited language and communication abilities depend on the severity of the head trauma (Arciniegas, 2009). Inhibited communication manifests in patients finding problems in locating words to use to express themselves. The patient may also exhibit problems with getting the right order of the words to use in expressing themselves, hence leading to a distortion of the message intended. These patients also display much difficulty in writing, reading, or spelling words that they would easily do in the past (Armonda et al., 2006; Kirkness et al., 2008; Lehtonen et al., 2007).

Another symptom that TBI patients display with regard to communication problems that is likely to affect employment outcome includes the inability of the patient

to maintain some conversation (Selassie et al., 2008; Starkstein & Jorge, 2008). Some patients appear not to be saying the right or expected words. Others use different voice tones or intonations that result in making inappropriate expressions (McHugh, Engel,& Butcher, 2007). Facial expression and other kinds of body language also appear misplaced or overreacting emotionally (Bennett et al., 2008; Harhangi, Kompanje, Leebeek,& Maas, 2008; Murray, Butcher,& McHugh, 2007). Other patients may act inappropriately or use misplaced or offensive terms without appearing to be embarrassed. Similarly, problems with communication can be treated with therapy and other forms of interventions synonymous with memory loss.

Emotional Symptoms

The emotional symptoms associated with TBI include depression, schizophrenia and generalized anxiety disorder, personality changes, hostility and aggression, and sexuality.

Depression. Depression and other forms of mood disorders have several etiological factors. The onset of depression (unipolar and bipolar) has been traced to several factors ranging from presence of genetic susceptibility to the incidence of specific environmental interference, such as a head trauma (Kennedy et al., 20047; Leal & Fitzpatrick, 2007). Different studies have found that a succinct combination of the right genetic susceptibility and environmental correlation could lead to depression (Ishibe, Wlodarczyk, & Fulco, 2009; Mainio et al., 2007; Shafi, Diza-Arrastia, Madden,& Gentilello, 2007).

Epidemiology studies on depression have arrived at the general susceptibility of about 2% to 19% of any individual suffering from unipolar depression (Hudak et al., 2011; Shukla, Devi,& Agrawal, 2011). However, for an individual who happens to be the first relative of patients, especially first-degree family members, then, the susceptibility is said to shift to between 5% and 25% (Fann, Burington, & Leonetti, 2008).

Nonetheless, several analyses and studies have pointed out some relationship between TBI and specific mental disorders. One of the most explored mental disorders with a direct relationship to head traumas is Alzheimer's disease (Menon, Schwab, Wright, & Maas, 2010; Menon & Harrison, 2008). In a study by Menon, Schwab, Wright, & Maas (2010), the researchers found that there exists a link between Alzheimer's disease, an allele of the apolipoprotein E (APOE) gene and the presence of a head trauma (Menon & Harrison, 2008). In addition, they established that a person's susceptibility to Alzheimer's disease increases by six times if a person is found to have one or two copies of the APOE protein in the gene (Menon et al., 2010). The Alzheimer's disease was found to be a purely genetic component. However, it is not a sufficient etiological factor to lead to Alzheimer's disease. In a study by Menon andHarrison (2008), an association between the presence of the gene APOE protein content and a head trauma was established. Vakil (2008) stressed that with the existence of the APOE genetic protein and a history of a head injury, the risk of Alzheimer's disease was found to increase nearly tenfold. Subsequent studies relating to the impact of head injuries on Alzheimer's disease found that head injuries had a significant impact on biological

processes (Arciniegas & Mcallister, 2008; Fann, Burington, & Leonetti, 2008; Kim et al., 2007). In this case, TBI influenced the pathogenesis of Alzheimer's disease, which was largely attributed to an increased beta-amyloid precursor protein (APP; Balestreri et al., 2007; McAllister, 2008). The increase in beta-amyloid precursor protein is said to exacerbate the APOE protein, thus increasing susceptibility to Alzheimer's disease (Ashman et al., 2008; Balestreriet al., 2007). In the same regard, the advent of Alzheimer's disease because of the APOE protein much relies on the severity of a head trauma. Severe head traumas have been found to release some of the proteins that are sometimes contained in different lobes of the brain. Interfering with the biological process through trauma may have such severe consequences (Arciniegas & Mcallister, 2008; Corrigan & Bogner, 2007). Depression following TBI has been linked to poor work performance as well as interpersonal relationships in the workplace (Arciniegas & Mcallister, 2008; Corrigan & Bogner, 2007).

Schizophrenia and generalized anxiety disorder. A separate analysis of a case of a correlation between mental disorders and TBI was established in schizophrenia (Terrio et al., 2009). Terrio et al. (2009) clarified that head injuries have a considerable relationship to schizophrenia. Comparative studies found that different schizophrenic cases had a history of head injuries. However, studies concerning the gene susceptibility because of head injuries were rather inconclusive in the case of schizophrenia (Felicetti, 2009; Gabella et al., 2007).

Other mental disorders have different gene-environment correlation. Generalized Anxiety Disorder (GAD), commonly referred to as neurosis, has been one of the consequences of TBI (Armonda et al., 2006; Bouwens et al., 2008). Different forms of anxiety could exist either alone or simultaneously with depression. In the process, such anxiety may bring to the fold other facets of the mental disorders, such as phobias, posttraumatic stress, and obsessive-compulsive disorders. Schizophrenia and GAD have been established to have negative impacts on a person's productivity (Armondaet al., 2006; Bouwens et al., 2008).

Personality changes. An individual's personality is a product of the thought process in the brain, which implies that a brain injury is likely to result in personality changes (Corrigan &Bogner, 2007; Fann et al., 2008; Harhangi et al., 2008). The brain works as the center of all actions of an individual and, largely, the day-to-day operations of the individual. Mathias and Wheaton (2007) emphasized that severe trauma to the brain does affect the chemical composition and eventually the processes of the brain. These changes in the chemical balance and process in the brain may eventually affect the functioning of the brain and, thus, personality (German Society for Trauma Surgery, 2008; Konczak & Timmann, 2007; Lewis, 2009; Mathias & Wheaton, 2007). The likely personality changes that may appear because of TBI include tiredness, attention disorders, and change in relation to different people, different concentration spans, irritability, and indifference to different social settings (Murray, Butcher, & McHugh,

2007; Mushkudiani, Hukkelhoven, & Hernández, 2008; Narayan, Michel, Ansell, & Baethmann, 2006).

One of the major personality disorders that follow a TBI is referred to as Orbitofrontal (pseudo psychopathic) syndrome in the DSM (Mathias & Wheaton, 2007; MRC CRASH Trial Collaborators, 2008). As the name suggests, the person seems to have fully deviated a common and reserved nature and tends to exhibit near-psychopathic characters (Maas et al., 2007; Mainio et al., 2007). The syndrome manifests in ways such as hyperactivity, disinhibition, impulsive character, sexual preoccupation, antisocial character, and high tendencies to distraction (Jagoda et al., 2009; Nampiaparampil, 2008). Psychomotor behavior of the patient is highly increased with more interest in matters that did not interest in the past (Jagoda et al., 2009). Orbitofrontal syndrome, with structured therapy and other modes of intervention, can be redirected for the benefit of the patient (Narayan et al., 2006; Saatman, Duhaime, Bullock, Maas, Valadka, & Manley, 2008).

On the other hand, a syndrome exhibits the opposite symptoms. Frontal Convexity Syndrome, commonly referred to as Pseudo Depressed Syndrome, is a condition that may follow TBI (Moss & Burris, 2007; Pagulayan, Machamer, & Dikmen, 2007; Nichol, Higgins, Gabbe, Murray, Cooper, & Cameron, 2011). Injuries to the head may make an individual appear less interested in some matters. The patient presents several symptoms, including apathy, reduced or inhibited psychomotor, indifference, perseveration, reduced initiative, and lack of persistence (Plata, Garce, Kojori, Grinnan, Krishnan, & Pidikiti, 2011). Changes in personality have also been found to vary with the

severity of TBI; however, this relation has not been found to be linear (Plata et al., 2011). Personality determines how a person relates with others as well as his/her behavior, which is likely to have an impact on employment. According to the German Society for Trauma Surgery, TBI results in tiredness, attention disorders, change in relation to different people, different concentration spans, irritability, and indifference to different social settings; this decreases work performance.

Hostility and aggression. Some patients who have suffered severe incidences of TBI may exhibit both verbal and physical aggression and impulsiveness (Hoge et al., 2006; NAN Policy and Planning Committee, 2009; Poca, Sahuquillo, Topczewski, Penarrubia, & Muns, 2007). Some experts have argued that such a characteristic is an exaggeration of previous personality and, in a sense, brought to the forefront after the TBI. Several measures may be taken to mitigate such disorders. They may include the use of antidepressants, beta-blockers, anticonvulsants, and antipsychotics (German Society for Trauma Surgery, 2008). Verbal and physical aggression affects how a person relates with his peers in the workplace, and this is likely to have a negative impact on employment outcomes. According to the German Society for Trauma Surgery (2008), employers do not prefer people who are hostile and aggressive, which implies that TBI is likely to reduce one's chances of securing employment.

Sexuality. One of the impacts of TBI that has been established is the consequences that head trauma has on the sexuality of an individual (Arciniegas, 2009). The brain, especially the structure that makes up the limbic system (the septal nuclei, the

amygdala, and the hypothalamus), is responsible for human sexual behavior (Aldermanet al., 2009). This is because these sections of the brain are responsible for the neuroanatomical and physiologic substrate that controls the hormones and other vital factors of the human body. With heavy damage to this part of the brain, the sexuality of the patient is, therefore, cognitively impaired (Alderman et al., 2009; Arango-Lasprilla et al., 2008; Servadei, Compagnone, & Sahuquillo, 2007).

Similarly, with varying categories of TBI to the frontal lobe, the social and sexual construct of the patient may be adversely affected. Injuries to the frontal lobe may affect the social nature of an individual; thus, it will be inhibited in appreciating social judgment and employing sexual overture (Powell et al., 2007), which may seriously influence the sexuality of a TBI patient.

Neuropsychological Evaluation

The tools used to perform neuropsychological evaluation on individuals with TBI include the Glasgow Outcome Scale and the Disability Rating Scale, which are discussed in the following subsections.

Glasgow Outcome Scale

The Glasgow Outcome Scale (GOS) refers to a five-point score given to patients with TBI at a certain point during their recovery (Armondaet al., 2006; Ashman et al., 2008; Assa & Pasternak, 2008). The scale offers an evaluation of the functioning of an individual victimized by a head injury. Some medical professionals also term the scale a practical measure of the social outcome due to a head injury intended to harmonize the

GOS as a predictive system (Balestreri et al., 2007; Bazarian et al., 2007). The GOS is a simple and hierarchical rating index having a limited number of broad classifications. The GOS focuses on the impacts that TBI has on key life areas rather than offering detailed information on the deficits. Individuals indexed within a single category represent a range of capabilities (Cardoso et al., 2007; Eslinger et al., 2007).

The scale assigns patients of TBI one of the five categories, which include“ death, persistent vegetative state, severe disability, moderate disability, and good recovery” (Arango-Lasprilla et al., 2008, p. 145). However, in 1981, the GOS was revised resulting in a new proposition that led to the classifying of patients who regained their consciousness (Corrigan & Bogner, 2007). In addition, the Glasgow Outcome Scale Extended (GOSE) provides both upper and lower subdivisions of the three categories used on conscious patients. It results in eight possible categories of rating TBI patients. Collapsing the subdivisions of the GOSE provides the ratings of the GOS (Hudak et al., 2011; Stevens et al., 2012).

The outcomes of a designed interview focusing on personal and social functional capabilities of an individual provide a basis for assigning the individual’s outcome category. Nevertheless, the ultimate evaluation draws on the lowest sign of the outcome category in the interview (Moss & Burris, 2007).

A patient rated as dead has no life as indicated by the category. Patients in the vegetative state category are incapable of interacting with their environment, hence considered unresponsive. Vegetative patients display spontaneous breathing and eye-

opening (Deb & Burns, 2007). Such patients also show impulse reaction in their limbs and are able to swallow food. Severe disability patients are capable of following commands, but they cannot live independently (Hoge et al., 2006). As a result, people in the severe disability category require another person's assistance to do some activities. Such assistance might vary from a continuous total dependency to the need for assistance with only one activity. Patients categorized in the moderate disability display various characteristics. They can live independently, but they are incapable of returning to school or work after sustaining the injury (Hoge et al., 2006; Gondusky & Reiter, 2008; Kim et al., 2007). Such patients can take care of themselves or travel from one place to another without necessarily demanding assistance. However, they cannot regain some previous activities, such as work, due to mental or physical deficit (Felicetti, 2009; Hart, Whyte, & Millis, 2006; Ishibe, Wlodarczyk, & Fulco, 2009). The last category of TBI patients is the good recovery. Patients under this category can return to school or work. As a result, they can resume their normal vocational and social activities, despite the few and minor mental or physical deficits (Hudak et al., 2011; Jellinger, 2010; Selassie et al., 2008).

The GOS has numerous advantages. The first benefit of the GOS is that many medical institutions prefer it to other scales, as it is extremely simple and provides reliable ways of describing the patient's recovery (Chang et al., 2009; Corrigan & Bogner, 2007). Another advantage is that the scale avails prearranged interviews and rules for its administration. Every interview has a way of integrating details about pre-injury conditions, hence offering a means for evaluating the outcome of the head injury.

The scale also comes with some limitations. The first limitation of the GOS is that it provides an overall evaluation of the outcome and does not outline the in-depth information regarding handicaps or disabilities (Hart et al., 2006). The categories provided by the GOS appear broad, and the scale does not mirror the slight improvements regarding the functional conditions of the patients. As a result, patients might improve significantly in their ability, but not in the outcome category.

Disability Rating Scale

The Disability Rating Scale (DRS) was developed for individuals who sustained a severe head injury with coma (Czarnik et al., 2007; Ding et al., 2008). The scale provided a way for monitoring the level of patients' disability and rehabilitation in the community. The DRS provides quantitative information about the recovery progress of a TBI patient (Ding et al., 2008). The design of the scale reflects the changes concerned with the following areas: arousal and awareness, cognitive ability to address problems regarding self-care, level of dependence, and adaptability (Kirkness et al., 2008). The scale consists of eight items included in the above named areas. Every item has its rating that ranges from either 0 to 3 or 0 to 5 (German Society for Trauma Surgery, 2008).

Items are either in half or one-point increments. The sum of all the eight items gives the composite or total score. Lower scores reflect less disability, whereas higher scores reflect a higher level of disability (Arciniegas et al., 2009). The composite score provides a basis for assigning a patient one of the 10possible disability outcome categories. For instance, a score of 0 assigns a patient to the no disability category. A

score of 29 assigns a patient to the extreme vegetative category, and a score of 30, the maximum score, assigns a patient to the death category. According to Bruns and Hauser (2008), DRS are extremely quick and can take about 5 minutes to complete.

The DRS has various advantages. The first benefit of the DRS is that it comprises items across all key dimensions of impairment, disability, and handicap. The scale is a precise and straightforward tool which facilitates the ongoing evaluation of recovery from the onset of the injury to the community reintegration (Corrigan & Bogner, 2007; Hou et al., 2007). Additionally, the scale may assign scores to the outcome categories with a relatively slight loss of data, hence providing an instantaneous snapshot of the patient's recovery and overall disability condition. The psychometric properties of the scale seem to be extremely dependable and more credible than other rankings, such as the GOS. Most importantly, the DRS can serve the purpose of the GOS, as it provides the scores of the GOS(Mathias & Wheaton, 2007).

The scale also comes with various limitations (NAN Policy and Planning Committee, 2009). The first limitation of this ranking is that it lacks preciseness in the description of what matches up to a successful item performance at each level of rating. The subscales of DRS do not precisely specify the areas of intervention. According to Bruns and Hauser (2008), the sequelae of TBI included for evaluation have a limitation, as they do not include cognition (Gabella et al., 2007). The scale also evaluates a general function instead of specific functional changes. The DRS can be helpful when used to characterize patients in the severity category and to provide the ways of comparing other

groups of patients. It implies that the scale is not sensitive to the treatment impacts meant to improve the social participation or functional limitation of patients.

The DRS appears unsuitable for patients suffering from severe impairments or a mild TBI. Medical professionals recommend the use of the half-point increment in order to increase sensitivity and precision when evaluating the functioning of patients (Armonda et al., 2006). Medical professionals have also determined some conditions to govern the use of this scale. For instance, when a patient does not suit the whole-point description when assessing dependence on others, the cognitive ability with regard to the self-care items and employability, total scores having half points are rounded down. This is meant to ease the process of assigning the score to an outcome category. Notably, the use of the half point option seems to limit the sensitivity of the DRS to change from the patients' discharge to one-year and five-year follow-ups (Konczak & Timmann, 2007; Ruff, 2008).

The DRS is a measurement tool that uses quantitative information to describe the recovery process of a patient suffering from TBI (Corrigan & Bogner, 2007). In the context of this study, the DRS was measured using factors such as arousal and awareness, cognitive abilities to address problems relating to self-care, level of dependence and adaptability, with each scale factor having a scale that ranges from 0 to3 and 0 to5 (Gennarelli et al., 2009). Data relating to DRS were gathered using observational and interview methods and scores. The DRS measures were helpful in drawing the nature of the relationship between employment-related self-efficacy among whites and other

minorities, which pointed out that a higher DRS is linked to lower self-efficacy, resulting in low work performance (Draper et al., 2007; Wang et al., 2008). In addition, the DRS scores were measured during the pre-injury and postinjury periods to make correlations with regard to the onset of TBI.

Satisfaction With Life and TBI

Satisfaction with life refers to a person's perceptions regarding his/her position in life with respect to their value and cultural systems that they are living in as well as their concerns, standards, expectations, and goals (Corrigan & Bogner, 2007). This implies that satisfaction with life is a subjective assessment that draws upon the environmental, social, and cultural context. Satisfaction with life has been studied in relation to TBI in several domains, including physical, social, psychological, and cognitive domains. The physical health domain includes activities associated with daily living, fatigue and energy, work capacity, and discomfort (Draper et al., 2007). The psychological domain includes body appearance and image, self-esteem, positive and negative feelings, concentration, memory, learning and thinking (Draper et al., 2007). Research in satisfaction with life and the physical functioning has reported mixed findings. Some researchers have reported that physical functioning is predicative of satisfaction with life (Draper et al., 2007).Some have not reported such relationships (Corrigan & Bogner, 2007),whereas others have reported that fatigue following TBI is prevalent in about 45% of participants after one year, especially those suffering from mild and moderate head injury (Gennarelli et al., 2009). In addition, fatigue is associated with other problems that

are prevalent among the TBI population, such as depression, pain, and somnolence during daytime and sleep disturbance. In addition, lower satisfaction with life has been associated with emotional distress (Gennarelli et al., 2009).

Existing literature points out that life satisfaction is related to the level of social contact and support that is available (Korczak & Timmann, 2007). Severe and moderate TBI usually leads to relationships falling away, and establishing new relationships is relatively difficult, as there is limited interaction with others. Limited mobility further hampers the opportunity to make contact with other people (Ruff, 2008). Employment has also been shown to be a significant determinant of satisfaction with life, as it has an impact on other crucial variables of satisfaction with life, like opportunities to meet new people, financial security and the standard of living. Research has established that individuals suffering from TBI (severe to moderate) are highly likely to be laid off from their work. In addition, leisure disability is also an outcome of TBI, whereby individuals with severe to moderate TBI tend to have significantly lower "quality of leisure activities" following the head injury (Korczak & Timmann, 2007).

Implications for Employment of Individuals With TBI

Recent studies on TBI rehabilitation have focused on measuring the outcomes, narrowing down the impact of rehabilitation on the patients' quality of life (Alderman et al., 2009; Arciniegas & Mcallister, 2008; Cardoso et al., 2007). Vocational success has emerged as one of the key outcomes measured in TBI rehabilitation since there is a visible connection between self-esteem and financial status (Gabella et al., 2007).

Nevertheless, it appears usually difficult for TBI survivors to achieve their occupational objectives (Assa & Pasternak, 2008; Deb & Burns, 2007). According to various researchers, many TBI survivors suffer from cognitive, psychological, and physical deficits, which considerably affect their capability to seek and maintain employment (Arciniegas & Mcallister, 2008; Ashman et al., 2008). The same researchers refer to the significance of dealing with these deficits with a helpful rehabilitation team approach concentrating on evaluating the variables and physical, functional, and cognitive factors.

Employing individuals suffering from TBI results in arousal problems, which include reduced or lack of alertness, inability to attend to environmental occurrences and details, and reduced capacity for processing information (Arciniegas et al., 2009; Gabella et al., 2007; Hart et al., 2006; Kirkness & Thompson, 2009). Individuals with arousal problems appear extremely slow in responding and reacting to others. Additionally, they are extremely vulnerable to fatigue due to physical or cognitive exertion (Armonda et al., 2006).

TBI patients are easily distracted, which implies that they exhibit reduced concentration at the workplace. Survivors of traumatic brain injury display impaired concentration and attention abilities, which can increase their levels of getting distracted (Czarnik et al., 2007). The distraction might result because they try to respond to interferences that are either internal or external stimuli. TBI survivors might also exhibit some inability to filter out external noises, making concentration difficult. Many workplaces have diverse environmental noise, including conversations, humming of

office machines, and office traffic (Butcher & Mineka, 2007; Mainio et al., 2007). Controlling these external noises will automatically improve the productivity of patients suffering from TBI. An example of internal noises that offer distraction to TBI individuals is internal conversations taking place in the mind. Intrusive inner thoughts can interfere with productivity significantly (Deb & Burns, 2007; Felicetti, 2009). Notably, the internal conversation seems to be hard for management to control. As a result, the management can only observe the internal conversation by interrupting the performance of a TBI patient.

Employing individuals suffering from TBI results in poor self-managing in the workplace (Bruns & Hauser, 2008; Gennarelli et al., 2009). The damage to the frontal lobe leads to deficits in the executive functioning of an individual. Effective executive functions enable workers to engage in independent, well-organized, self-regulated, purposeful, and well-planned, or goal-oriented, behaviors or tasks (Ashman et al., 2008). The impairment of these abilities resulting from brain injury causes a worker to have some difficulty in maintaining sufficient self-care, social relationships, and employment. In addition, such individuals cannot function productively in a working environment. Employees suffering from TBI are frequently viewed as poor self-managers (Hart et al., 2006).

Another repercussion of employing individuals suffering from TBI is the rise of poor problem solvers in workplaces. According to Bruns and Hauser (2008), it is very difficult to determine whether an individual suffering from brain injury can take part in

abstract thinking. Such individuals often have difficulties in shifting to other readily available solutions to an existing problem (Ashman et al., 2008). This is because they have a limited capacity for thinking imaginatively. A poor capacity for abstract thinking can limit the productive activities one can pursue alone and affect the complexity and diversity of tasks he or she can attempt successfully (Bruns & Hauser, 2008).

Conceptualization is another area that is dependent on abstract thinking in which an individual might display cognitive deficits (Arango-Lasprilla et al., 2008). The capability to conceptualize efficiently depends on the area of higher-level cognition. An individual must have a store of learned material which is readily and reliably available to perceive the mental picture. Intact cognitive functions enable individuals to organize these mental pictures into an observable skill or activity. Problems resulting from brain injury can affect employment pursuits substantially (Arango-Lasprilla et al., 2007).

Memory loss and the incapability to recall information instantly are common signs of TBI (Arciniegas & Mcallister, 2008; Elaine et al., 2008). Memory loss is often observed at varying levels for many survivors, despite significant improvement being noted during recovery. According to various scholars, such as Bruns and Hauser (2008), over-learned information and fully functional memory usually depict areas of strength in an individual. The preserved skills are helpful in redeveloping vocational goals (Iverson, 2010). The repercussion posed by memory loss in the workplace is that these individuals frequently forget instructions from their seniors. It might result in conflicts between the employees and their managers (Selassie et al., 2008).

Increased psychosocial issues in the workplace are another implication of employing individuals suffering from traumatic brain injury. When an individual's capability to work is affected due to TBI, it becomes important to consider psychosocial challenges (Hudak et al., 2011). These challenges can be more devastating than the cognitive and physical effects. Psychosocial challenges can be extremely difficult to discover and address or accommodate. However, many workers will reject adaptation and accommodation mechanisms of addressing psychosocial issues because they cannot handle the psychosocial challenges. As a result, these issues tend to increase, as no possible solution is available (Arciniegas et al., 2009). A psychosocial issue that usually mystifies potential success is that an individual might not be capable of resuming the same job position he/she initially held before sustaining brain injuries. It can result in bitterness and resentment because such individuals might take a job position that is less important than their initial job. As a result, the rehabilitation team faces more challenges because they must identify the work experience that matches up with the present interests and abilities (Konczak & Timmann, 2007).

Employment Outcomes After TBI

Employment outcomes following TBI are viewed in the light of productive employment and return to work following a TBI.

Productive Employment After TBI

Rehabilitation and improvement in one's abilities after a TBI can be affected by impaired coping and distress among patients (Assa & Pasternak, 2008). Bruns and Hauser

(2008) indicated that group treatment to improve coping skills after a TBI increased the perceived self-efficacy of the participants. Perceived self-efficacy (PSE) refers to an individual's beliefs about their capability to influence events that affect one's life. Possessing high self-efficacy reflects the optimistic nature of a person, while possessing poor self-efficacy reflects the pessimistic nature of an individual. Survivors of TBI are vulnerable to poor perceived self-efficacy, which implies that they display high levels of pessimism (Armonda et al., 2006; Kirkness et al., 2008). In addition, such individuals frequently feel that a situation is out of their control.

In relation to an employment outcome, self-efficacy is important in determining the capability of an employee to engage in productive work (Deb & Burns, 2007). Employees having high PSE are capable of withstanding managerial pressure and delivering their productive work (Hudak et al., 2011; Kim et al., 2007). This is because of high levels of optimism. On the other hand, employees having poor self-efficacy resulting from brain injury cannot withstand pressure, hence cannot deliver their obligations on time as compared to their counterparts who have not suffered from TBI (Bennett et al., 2008; Bercaw et al., 2011; Corrigan & Bogner, 2007). In addition, the stress that accompanies brain injury tends to lower the self-efficacy of a survivor. There is a belief that one's capability to participate in social roles and daily activities dramatically increases motivation and coping strategies, hence increasing the chances of improving social engagement (Bhatia & Gupta, 2007; Fann et al., 2008; Konczak & Timmann, 2007).

Return to Work (RTW) After TBI

Individuals suffering from TBI want to resume their occupation, although joining the workforce is difficult. Notably, scholarly sources have not clearly specified the amount of public assistance offered by TBI survivors. According to Bruns and Hauser (2008), individuals who have experienced TBI face many difficulties in obtaining employment during the first year after the injury. The study also indicated that as personal financial resources of a TBI survivor decrease, public assistance increases.

Foretelling the employability of a TBI survivor appears to be a sophisticated process. Many factors affect productivity outcomes (Harhangi et al., 2008). Many studies, such as those performed by Bruns and Hauser (2008) and Eslinger et al. (2007), indicated that approximately30%return to work. The same researchers revealed that individuals with higher levels of education and fewer disabilities had higher chances of getting employed after two to three years postinjury (Eslinger et al., 2007). In addition, TBI survivors having no history of substance abuse were most likely to resume employment after two years postinjury (Elaine et al., 2008; Jagoda et al., 2009; Jang et al., 2009).

According to the studies undertaken by the TBI Model Systems, early neuropsychological testing seemed to be helpful in foretelling the outcome of sustaining TBI. Bruns and Hauser (2008) asserted that completing neuropsychological tests with normal range scores dramatically increased the chances of employee productivity by about 40% to 130%. Individuals suffering from brain injuries tend to overestimate their capabilities, specifically in the areas of thinking, behavior, and skills (Jiang et al., 2007;

Lai et al., 2008). For example, TBI survivors with memory problems might not know that they have the problem; this causes an individual not to achieve their professional goals (Jiang et al., 2007). Moreover, the lack of awareness makes individuals overestimate their capabilities, leading to problems with their family life, employment, and socialization.

Summary

From the literature review, it is apparent that TBI has considerable impacts on employment outcomes, which has been evaluated in engagement in productive employment, return to work after TBI, and ethnicity in employment outcome. The survivors of TBI are vulnerable to poor perceived self-efficacy leading to poor work performance, which implies that they display high levels of pessimism. In addition, such individuals feel frequently that a situation is out of their control. In relation to the employment outcome, self-efficacy and engagement in productive workare imperative in determining the capability of an employee to engage in meaningful work. Furthermore, TBI leads to numerous emotional, physical, and cognitive deficits that pose a significant barrier in community reentry. The following chapter discusses the methods that were used to achieve the research aims and objectives.

Chapter 3: Research Method

Introduction

The main aim of this study was to evaluate the association between TBI and engagement in productive work. I sought to explore how the cause and severity of injury affects productive work after the onset of TBI. This chapter addresses the research design that was used in this study with regard to the data source, the sampling plan, participants, research design and justification, and instrumentation as well as the ethical issues encountered in this study.

Data Source

Ness (2010) pointed out that there are two main forms of data: primary (gathered by an investigator him or herself) and secondary data (gathered from other researchers). In the context of this study, I used secondary data sources in the form of archival data sources. According to Vogt, Gardner, and Lynne (2012), archival data refers to the data that have been documented either by previous evaluations or studies or through administrative procedures by a given agency. Mitchell and Janina (2009) asserted that some of the types of data gathered from archival data can include health and development outcomes; behavior; demographics; attitudes, such as social, political, and racial; environment factors influencing the population; and awareness and knowledge of issues, among others.

The reason for using archival data for the study draws upon the comprehensiveness and accuracy of archival data, as the data are gathered by experts.

However, when making use of archival data, availability and relevance should be taken into consideration, and they were considered during the actual study (Vogt et al., 2012). Numerous limitations exist in the use of archival data. First, archival data are likely to be biased because of selective survival and selective deposit. Selective deposit takes place when biases tend to influence the type of information documented (deposited) in the archival database. Archival data are vulnerable to changes and errors in record keeping.

The following research questions and hypotheses were used for this study:

RQ1. What is the nature of the relationship between severity of TBI and engagement in productive work?

***H*1$_0$:** Severity of TBI negatively affects engagement in productive work.

RQ2. What is the nature of the relationship between cause of injury and engagement in productive work?

***H*2$_0$:** The cause of injury has an impact (fall related TBI, motor vehicle accidents, struck by/against events, industrial and work-related accidents, and assaults) on engagement in productive work after TBI.

RQ3. What is the nature of the relationship between satisfaction with life after TBI and engagement in productive work?

***H*3$_0$:** Satisfaction with life increases engagement in productive work after TBI.

RQ4. What is the nature of the relationship between participation activities and engaging in productive work after TBI?

***H*4$_0$:** Engaging in participation activities increases engagement in productive work.

Participants

As this is archival research, it is imperative to note that no live participants took part in the study; rather, I used archives consisting of records that had already been gathered from participants earlier. In this regard, the participants in this study included people who have succumbed to TBI as highlighted by the archival data (Ness, 2010). I examined the patient records to determine the relationship between TBI and engagement in productive work. In addition, there were inclusion and exclusion criteria used in the participants' selection in this study. The inclusion criteria is listed below:

1. The participant should have succumbed to an acquired TBI in accordance with the causes of TBI outlined in Chapter 1, which included fall related TBI, motor vehicle accidents, struck by/against events, industrial and work-related accidents, and assaults.
2. Prior to TBI, the participant should have been in active employment.
3. The participant should have consented to the use of his/her records for research.
4. The participant should have taken part in active employment following the TBI.
5. The participants were grouped according to the severity of injury.

Research Design and Design Justification

Research design outlines the steps required to answer the research questions and achieve the study objectives (Fisher, 2007). Mitchell and Janina (2009) asserted that the research design entails structuring the investigation to specify the variables and determine their interrelationships; therefore, the research design provides the outline that functions as a guide for the researcher while gathering data for the study. In this regard, Fisher (2007) asserted that the research design could be either qualitative or quantitative, depending on the research context and the structure of the research questions. On the other hand, quantitative research designs involve gathering and analyzing quantifiable data using statistical methods to infer conclusions from the findings.

A quantitative design uses the deductive approach, as research questions marked the beginning of the study and the study ended with a measurement of empirical data, analysis, and evaluation of data. The rationale for integrating quantitative design in the study design was because it provided empirical evidence to assess the relationship between the onset of TBI and engagement in productive work. It is evident that this study required the collection of quantitative data to assess the relationship between TBI and engagement in productive work. The data acquisition method comprised secondary data sources gathered by archival research.

As aforementioned, the preferred research method is archival research, which makes use of data archives that have already been documented, implying that archival research eliminates the need for actual observation or survey (McBurney & White, 2009).

Several archives contain information specifically collected to address some specific research topics. In this regard, I identified numerous potential archives that could contain pertinent data relating to this study.

Sampling Plan

Ness (2010, p.125) defined a sample as "a subset of the population of interest that denotes larger population." In addition, samples play an integral role in making inferences relating to the population being investigated. According to Ramsey et al. (2009), sampling techniques allow the researcher to lessen the amount of data required by the researcher, wherein data are collected from a subgroup rather than from all probable cases. Fisher (2007) recommended the use of probabilistic sampling, as it helps in enhancing the validity of the research and reducing bias. Probability sampling techniques give all the elements in the population equal chances of selection in the sample, which plays an instrumental role in enhancing the reliability of the study. In this regard, this study used a stratified sampling technique, which is a probabilistic sampling approach wherein the target population is divided into subgroups, followed by a proportional random selection of the final subjects from the various subgroups (strata). Ness (2010) pointed out that a stratified sampling plan is used when the researcher aims at highlighting particular subgroups in the entire population. The rationale behind the use of stratified sampling is because of the need for the participants for the study to be divided based on their gender and the severity of an injury.

It is imperative for the researcher to ensure that the subgroups usedin stratified sampling do not overlap, as overlapping strata will give some subjects higher probability of being selected as participants in the sample, which implies that the sample ceases to be probabilistic. The sample size for this study was computed using a statistical power analysis. In hypothesis testing, two crucial errors are likely to be observed: Type 1 error (α, which occurs when the null hypothesis is valid although it is disputed) and Type II error (ß),which occurs when the null hypothesis is not true, but it is not disputed). The power of the test (1-ß) infers the probability of making the correct conclusions. According to Ness (2010), a statistical test having a larger sample size can lessen both Type I and Type II errors. Therefore, the aim is to get a sample that is large enough to make sure that1-ß is at a relatively reasonable level, at least 80%. A larger sample size implies a greater power to detect the true difference, which translates to a smaller *p*-value. In this case, the power is 95%,*a* = 5% delta = 1, sigma = 2.2; therefore, this study required65 pairs of subjects to be able to reject the null hypothesis that the response difference is 0 at a probability (power) of 0.95. The Type I error probability associated with the test of this H_0 is 0.05.

In this regard, the sample was first divided into subgroups based on gender, which included males and females. The subgroups were divided equally, wherein the total number of participants was n=1,322; therefore, the sample for males n_1=980, whereas the sample for females n_2=341. At a power value of 0.95, I had to have a sample of 1,322 to detect the differences at 95% power. The choice of stratified random sampling draws

from the fact that stratified random samples have greater precision when compared to the conventional simple random samples. This is because the greater the variability between the subgroups, the greater the measure of precision. Secondly, this sampling technique has administrative advantages, as it is relatively easy to stratify the given sample when compared to selecting a simple random sample (Vogt et al., 2012). Lastly, stratified random sampling ensures that the sample covers the population effectively; this is because I had the capability to control the strata included in the final sample. The only limitation associated with stratified random sampling is that it increases the complexity of organizing and analyzing the results (Fisher, 2007).

Databases for Archival Data Source

Archival data were collected from leading providers of support programs for adults and children who have acquired TBIs and developmental disabilities. The data were gathered from the leading providers of TBI support in a large urban area in the Southwest region of the United States. In addition, organizations involved with advancing brain injury research, education and treatment, and improving the lives of people affected by TBI were considered as potential sources of data. This is an important source of archival data relating to how a brain injury affects individuals and their daily lives. Organizations with rehabilitation programs focusing on assisting patients to regain behavioral, cognitive, and physical skills that are required to resume a normal and independent life following TBI were taken into consideration. The study used seven databases to gather adequate data for the purposes of this study. The selection of

participants' data from the databases was based on the availability and completeness of information; therefore, there was no plan to distribute the participants based on the databases; rather, the criteria for selecting the participants was based on the completeness and availability of the needed information related to the purpose of this study.

Instrumentation

According to Sherri (2011), the instrumentation plan comprises decisions about when and how to collect data, and how to perform an analysis on the data. Ramsey et al. (2009) asserted that these decisions have to be incorporated as the core component of the instrumentation plan for any research, as they play an instrumental role in guiding the progress of the research towards the achievement of the eventual goal of collecting data and making conclusions to evaluate the research hypothesis and answer research questions.

Ramsey et al. (2009) defined data as the information that the researcher collects to answer the research question, and it can be in the form of objects, words, or numbers. In this regard, the instrumentation process provides an outlook on the data that the researcher needs to collect and the precise time for collecting the data. According to Mitchell and Janina (2009), the research questions and hypotheses determine the data to be collected. With respect to this, the data collected included cause of injury and severity of injury as well as engagement in productive work.

Engagement in Productive Work

Productive work was measured using the pre- and post-injury employment status of the participant. The TBI model systems contain data on the employment status of participants, which is defined by their capability to engage in productive work with scores assigned using hours worked per week and earning power among other items. Employment status was measured for each participant during pre- and post-injury to ascertain any significant differences with regard to the dependent variables that I used in the study.

The Glasgow Coma Scale (GCS)

The GCS is the most extensively used measurement for TBI adopted in many studies as well as clinical practice (Ashman et al., 2008; Assa & Pasternak, 2008). The neurological scale has been employed to measure the conscious state of an individual both in an initial evaluation and after TBI. The aim is to measure the severity of TBI based on a normative standard principle (AFE Study Investigators, 2007; Ashman et al., 2008; Rutter & Silberg, 2010). The extensive use of the scale can be attributed to the simplicity of the method of grading the patient. The GCS employs a simple scoring methodology with scores as low as 3 and a maximum of 15 (Hoge et al., 2006). The scores range from 3, meaning a severe state of a head injury leading to a coma, to a maximum of 15, for a very mild case of a head injury. The GCS is particularly important for measuring the severity of the injury in emergency cases and in physical traumatic

cases. This methodology of estimating the severity of the head injury was developed by Jennet and Teasdale from the University of Glasgow (Assa & Pasternak, 2008).

Physicians use the above scale to determine the extent of a head injury. As the scale appears, physicians review the functionality of the brain using the three elements. Fewer points are awarded for severe cases, and higher points are awarded for mild cases (Arciniegas & Mcallister, 2008). Thus, the GCS considers a score between 3 and 8 to be severe. Scores between 9 and 12 are considered moderate. The score 13 and above are considered mild (Hudak et al., 2011).

There are particular implications of the measurement as determined by the GCS. According to the scale, mild injuries imply temporary cognitive inhibited capabilities that can be easily reversed through therapy and clinical treatment (Ashman et al., 2008; Assa & Pasternak, 2008). Moderate and severe measurements, according to the scale, may result in vast impairment both in the cognitive and physical terms (Armondaet al., 2006). The very severe patient with a score of 3may remain vegetative or eventually die (Bouwens et al., 2008; Corrigan & Bogner, 2007). The other severe reading may result in physical impairments, such as paralysis and other forms of disabilities. The reliability and validity of the GCS has been affirmed by various studies. Assa andPasternak (2008) reported a mean interval consistency co-efficient (ICC) of 0.998, Kappa coefficient of 0.981, and a correlation coefficient between the items of r=0.980; this confirms the validity and reliability of the GCS for evaluating the degree of consciousness among people with TBI.

Satisfaction With Life Scale

The Satisfaction With Life Scale (SWLS) measures life satisfaction, which is considered a crucial factor in the subjective wellbeing construct. Empirical research and theory in rehabilitation points out that subjective well being comprises a minimum of three components, which include life satisfaction, negative affective appraisal, and positive affective appraisal. Life satisfaction has been differentiated from affective appraisal in the sense that it is more cognitively driven rather than being emotionally driven. Life satisfaction can be evaluated with respect to a particular life domain such as work, family, and others. The SWLS comprises five items to be completed by the person whose satisfaction with life is being evaluated. Scores reported by the SWLS can be interpreted using absolute and relative life satisfaction. A score of 20 is the neutral point on the SWLS, whereby the participant is neither satisfied nor dissatisfied. Scores of 21-25 denote slightly satisfied, 15-19 denote slightly dissatisfied, 26-30 denote satisfied, and 5-9 indicate extremely dissatisfied. In this study, satisfaction with life was measured during the pre- and post-injury period to determine how it affects productive work. The reliability and sensitivity of the scale has been examined by several authors. For instance, Corrigan and Bogner (2007) reported an internal consistency using Cronbach's alpha coefficient of 0.82 as well as 2-month test-retest stability with a coefficient of 0.82.

Participation Activities

Participation in activities after TBI has the primary objective of reviewing activities of TBI patients in their communities and homes. As a result, this measure

attempts to make sense of a patient's daily life and the important things in their daily living. The participation activities in this study after TBI include participation at home, in schools, and in work activities; participation in social activities (friends and family); participation in mobility (out of house activities);and participation in community (eating out, shopping, sporting activities, movies, watching sports, and religious activities). In addition, participation measures performance in relation to the level of engagement, which includes the frequency of involvement in real life situations (Arciniegas, 2009).

Just like other community integration measures, participation can be typified as a form of adopting societal assumptions in relation to activities included under the assessment. In this variable, participation is viewed as involvement in activities that are inherently social, recreational activities taking place in community settings, occupational role functioning activities, or household activities. Some of the common activities assessed under this variable include the following (Arango-Lasprilla, Rosenthal, & Deluca, 2007):

1. Domestic life, such as house cleaning.
2. Major life areas, such as working for income.
3. Transportation, such as driving a car.
4. Interpersonal relationships and interactions, such as conversing with neighbors.
5. Civic and recreational life, such as going to movies.

Ethical Issues

There are two main ethical concerns when it comes to studies that examine medical records; they include obtaining informed consent and ensuring the confidentiality of the data collected (Arciniegas, 2009). The following are the ethical issues associated with this study.

1. Preservation and anonymity of the participants: all research studies should aim at guaranteeing the anonymity and confidentiality of the respondents. No information gathered will be revealed to anyone under any circumstance. In addition, the data mining process did not entail gathering personal details of the participants.
2. The research should not impose any harm to participants and researchers in the course of the study. In this regard, this study did not entail any clinical interventions, which implies that the participants were not placed in any harmful situation before, during, and after the study.
3. Data confidentiality: with this regard, the study ensured that the archival records being used in this study would not be revealed to anyone under any circumstance.
4. Informed Consent: It is an ethical requirement for any study to ensure that it obtains informed consent from participants prior to using their records. In this regard, the study made sure that only records with signed informed consents from patients were used in this study.

Data Analysis

The study used both descriptive and inferential statistics to derive conclusions regarding the variables of interest. Data were summarized and described using descriptive statistics, such as measures of central tendency (mean and percentage) as well as measures of dispersion (standard deviation; McBurney & White, 2009). A significant limitation associated with descriptive statistics is that it cannot be used in inferring conclusions; rather, it is used for describing data. Inferential statistics was helpful in generalizing the data gathered during the study.

RQ1. What is the nature of the relationship between severity of TBI and engagement in productive work?

***H*1$_0$:** Severity of TBI negatively affects engagement in productive work.

For this hypothesis, one-way ANOVA was used to compare the means of productive work scores for each of the groups of severity of TBI as reported by the GCS.

RQ2. What is the nature of the relationship between cause of injury and engagement in productive work?

***H*2$_0$:** The cause of injury has an impact (fall related TBI, motor vehicle accidents, struck by/against events, industrial and work-related accidents, and assaults) on engagement in productive work after TBI.

The data analysis technique for the second research question was one-way ANOVA, which involved comparing the means of the values obtained from the

productive work scores of the various causes of TBI to see if productive work is dependent on cause of injury.

RQ3. What is the nature of the relationship between satisfaction with life after TBI and engagement in productive work?

***H*3$_0$:** Satisfaction with life increases engagement in productive work after TBI.

The data analysis technique for the third research question was correlations, which was used to determine whether a negative or positive correlation exists between the productive work scores and Satisfaction With Life Scale scores.

RQ4. What is the nature of the relationship between participation activities and engaging in productive work after TBI?

***H*4$_0$:** Engaging in participation activities increases engagement in productive work.

The data analysis technique for the fourth research question was correlations, which was used to determine whether a negative or positive correlation exists between productive work and participation activities.

Threats to Validity

With respect to internal validity, there are numerous confounding variables known to have an effect on productive work that are not related to TBI such as task complexity, task focus and skills level, the work environment and interrelationships with workmates, and the nature of task, among others. In this study, there were no potential threats to external validity.

Summary

This study used archival data gathered from the Traumatic Brain Injury National Data and Statistics Center (TBINDSC). This study examined patient records to determine the relationship between TBI and engagement in productive work. The inclusion criteria were that participants should have succumbed to an acquired TBI in accordance with the causes; prior to TBI, the participant should have been in active employment; participants should have consented to the use of their records for research; participants should have taken part in active employment following the TBI; and participants were grouped according to the severity of injury. A quantitative research design was used because the variables of interest in the study were quantified, after which relationships between the variables were explored. The rationale for integrating quantitative design is in the study design was that it provided empirical evidence to assess the relationship between the onset of TBI and engagement in productive work. I used the stratified sampling technique, which is a probabilistic sampling approach wherein the target population is divided into subgroups followed by a random selection of the final subjects proportionally from the various subgroups. The rationale behind the use of stratified sampling is because of the need for the participants for the study to be divided based on their gender and the severity of an injury. The sample size for this study was computed using a statistical power analysis. The sample was first divided into subgroups based on gender, which included males and females. The subgroups were divided equally, wherein the total number of participants was n =1,322; therefore, the sample for males n_1=980,

whereas the sample for females n_2=341. At a power value of 0.95, I had to have a sample of 1,322 to detect the differences at 95% power. The main outcome variable was engagement in productive work, which was measured using pre- and post-injury employment status of the participants. Independent variables included severity of TBI, measured using GCS, satisfaction with life after TBI measured using SWLS, participation activities, and causes of injury. Data analysis involved the use of one-way ANOVA and correlational statistics. The IRB approval number is 12-17-13-0032039.

Chapter 4: Results

Introduction

This chapter shows the findings of this research, including the descriptive and inferential statistics. The descriptive statistics of participants are provided, including the relationship between TBI and employment outcome variables used in this research. I begin this chapter with a description of research participants, followed by means and standard deviations of study variables and the independent variables in this study. I also provide a discussion of the research questions used in this research. It is important to note that there were numerous cases of missing variables for the study variables. As a result, the initial sample of 130 could not yield significant results, which compelled me to use a sample of size of n = 1,322 to cater for the missing data. In addition, the expectation maximization technique was used to compute replacements for continuous variables, which included participation activities.

Demographic Characteristics of Research Participants

The participants in the study were comprised of female participants (25.8%) and male participants (74.2%; n = 1,322). The marital composition of participants included single (49.4%), married (30.9%), divorced (10.9%), widowed (5.7%), and separated (3.1%) participants. Table 1 shows participants' composition.

Table 1

Participant Composition – Marital Status, Gender, and Employment Status

Employment status: Primary			Sex		Total
			Female	Male	
Full time student	Marital status	Single	51	103	154
		Married	0	1	1
		Divorced	1	1	2
		Separated	0	1	1
		Widowed	0	1	1
	Total		52	107	159
Part time student	Marital status	Single	1	6	7
		Married	1	0	1
		Divorced	3	0	3
	Total		5	6	11
Competitively employed	Marital status	Single	139	467	606
		Married	99	381	480
		Divorced	32	103	135
		Separated	15	42	57
		Widowed	18	9	27
	Total		303	1002	1305
Taking care of house or family	Marital status	Single	4	5	9
		Married	30	3	33
		Divorced	3	0	3
		Separated	2	0	2
		Widowed	6	1	7
	Total		45	9	54
Special employed	Marital status	Single	1	4	5
		Married	1	0	1
		Separated	0	1	1
Table Continues	Total		2	5	7

Employment status: Primary			Sex		Total
			Female	Male	
	Marital status	Single	3	10	13

Retired: Age-related		Married	34	82	116
		Divorced	9	13	22
		Separated	2	2	4
		Widowed	35	22	57
	Total		83	129	212
	Marital status	Single	14	94	108
Unemployed: Looking		Married	5	17	22
		Divorced	4	14	18
		Separated	2	4	6
	Total		25	129	154
Volunteer work	Marital status	Single	2	4	6
		Married	4	4	8
		Divorced	1	0	1
		Widowed	1	0	1
	Total		8	8	16
Retired: Disability	Marital status	Single	1	32	33
		Married	12	23	35
		Divorced	6	17	23
		Separated	3	7	10
		Widowed	5	1	6
	Total		27	80	107
Unemployed: Not looking	Marital status	Single	12	57	69
		Married	8	6	14
		Divorced	6	8	14
		Separated	4	2	6
		Widowed	2	0	2
	Total		32	73	105
Retired: Other	Marital status	Single	0	1	1
		Married	2	8	10
		Divorced	0	1	1
		Separated	0	2	2
		Widowed	6	2	8
	Total		8	14	22
On leave from work: Not receiving pay	Marital status	Married	0	2	2
		Widowed	1	0	1
	Total		1	2	3

Mean and Standard Deviations of Study Variables

Severity of injury was measured using the GCS. The research patients (n = 1,322) reported M = 7.38, SD = 4.460. In this study, the cause of injury was classified using the ICD-9-CM E-Code categories, which included vehicle-related injuries, fall-related injuries, violence-related injuries, and other.

It was evident that motor vehicle injuries were the most prevalent cause of TBI, with a majority of participants (39.1%) having TBI caused by motor vehicles. Another significant cause of TBI among the selected participants was falls, with 19.9% of participants in the study having fall-related TBI. Other notable causes of TBI included motorcycles (10.9%), assault with a blunt instrument (9.8%), and pedestrian (8.1%). A detailed overview of the causes of injury is provided in Table 2.

Table 2

*Cause of Injury * Sex Cross Tabulation*

			Sex		Total
			Female	Male	
Cause of injury	Motor vehicle	Count	149	365	514
		% within Sex	43.8%	37.5%	39.1%
	Motorcycle	Count	20	123	143
		% within Sex	5.9%	12.6%	10.9%
	Bicycle	Count	3	24	27
		% within Sex	.9%	2.5%	2.1%
	All-terrain vehicle (ATV) and All-terrain cycle (ATC)	Count	4	15	19
		% within Sex	1.2%	1.5%	1.4%
	Other vehicular: Unclassified	Count	1	5	6
		% within Sex	.3%	.5%	.5%
	Gunshot wound	Count	15	43	58
		% within Sex	4.4%	4.4%	4.4%
	Assaults with blunt instrument	Count	11	118	129
		% within Sex	3.2%	12.1%	9.8%

			Male	Female	Total
	Other violence	Count	3	6	9
		% within Sex	.9%	.6%	.7%
	Water sports	Count	0	1	1
		% within Sex	.0%	.1%	.1%
	Field/Track sports	Count	0	2	2
		% within Sex	.0%	.2%	.2%
	Winter sports	Count	0	8	8
		% within Sex	.0%	.8%	.6%
	Air sports	Count	0	2	2
		% within Sex	.0%	.2%	.2%
	Other sports	Count	6	10	16
		% within Sex	1.8%	1.0%	1.2%
	Fall	Count	86	175	261
		% within Sex	25.3%	18.0%	19.9%
	Hit by falling/flying object	Count	1	12	13
		% within Sex	.3%	1.2%	1.0%
	Pedestrian	Count	41	65	106
		% within Sex	12.1%	6.7%	8.1%
Total		Count	340	974	1314
		% within Sex	100.0%	100.0%	100.0%

Note. There were missing data for 8 cases.

Life is Close to Ideal

Data collected indicated that research participants sampled (n = 466) had M = 4.12, SD = 2.07 for participants' satisfaction with "life is close to ideal" (there were missing entries for 856 cases among the sample selected for this study). Therefore, out of 1,322, 852 participants did not provide entries for this measure. In addition, 16.6% strongly disagreed that their life is close to ideal, 13.3% disagreed, 10.2% slightly disagreed, 8.0% neither disagreed nor agreed, 16.0% slightly agreed, 24.6% agreed, and 11.3% strongly agreed that their life is close to ideal. Figure 1 summarizes participants' ratings for "life is close to ideal."

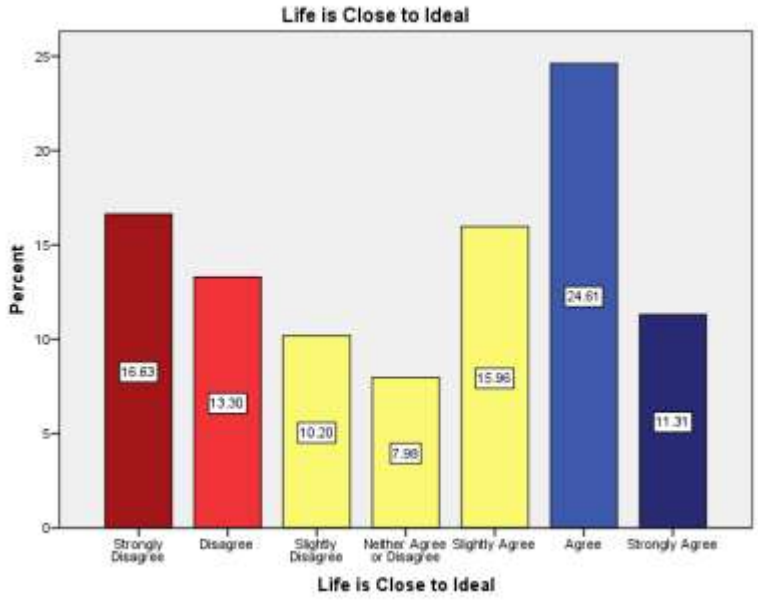

*Figure 1.*Participants' ratings for "life is close to ideal."

Life Conditions Are Excellent

The data collected indicated that research participants sampled (n = 466) had M = 4.14, SD = 2.03 (there were missing data for 856 cases among sampled participants). In

addition, 14.2% strongly disagreed that their life conditions are excellent, 14.9% disagreed, 12.4% slightly disagreed, 6.4% neither disagreed nor agreed, 16.0% slightly agreed, 25.9% agreed,and10.2% strongly agreed that their life conditions are excellent. Figure 2 summarizes participants' ratings for "life conditions are excellent."

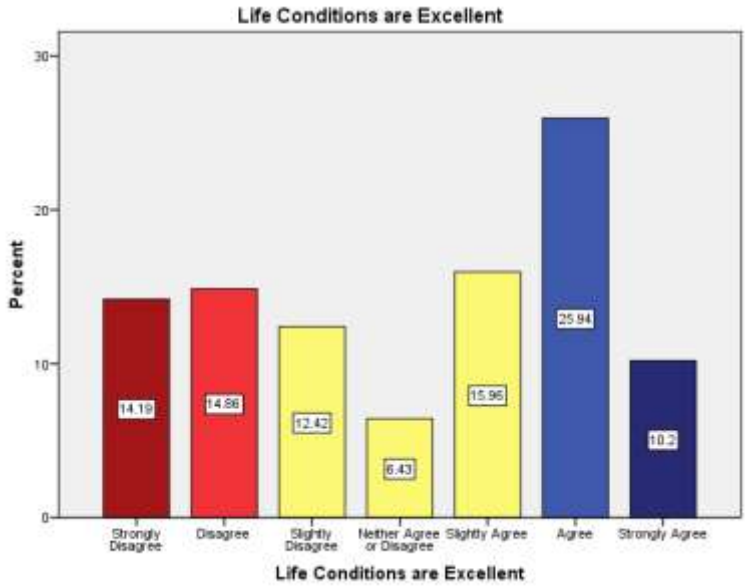

Figure 2. Participants' ratings for "life conditions are excellent."

Satisfaction With Life

The data gathered indicated that sampled participants (n = 451) had a mean satisfaction with life of M = 4.62, SD = 2.02 (there were missing data for 856 cases among sampled participants). Moreover, 12.6% strongly disagreed that they are satisfied with life, 8.9% disagreed, 10.0% slightly disagreed, 4.7% neither disagreed nor agreed, 15.7% slightly agreed, 32.4% agreed,and15.7% strongly agreed that they are satisfied with life. Figure 3 summarizes participants' ratings for "satisfaction with life."

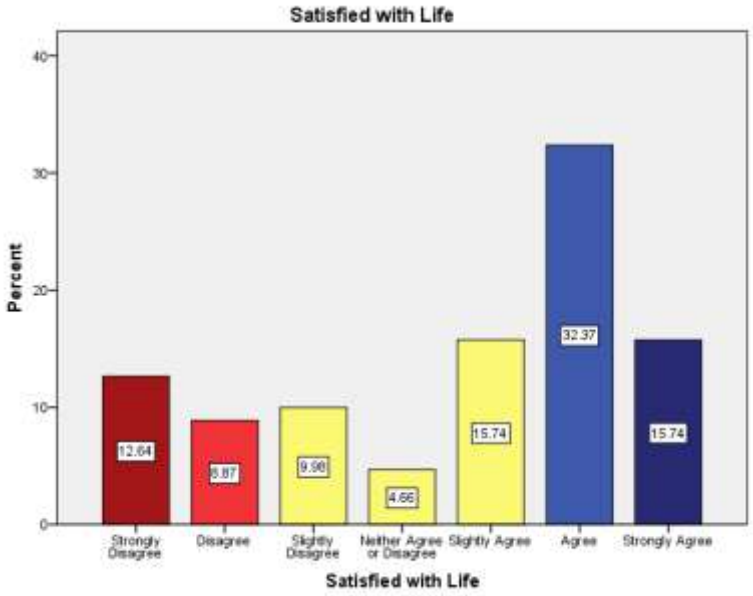

Figure 3. Participants' ratings for "satisfied with life."

Gotten Important Things Out of Life

The results indicated that research participants (n = 199) had a mean satisfaction of M = 4.71, SD = 1.93 (there were missing data for 856 cases among sampled participants). In addition, 9.5% strongly disagreed that they have gotten important things in life, 10.9% disagreed, 8.4% slightly disagreed, 5.5% neither disagreed nor agreed, 16.4% slightly agreed, 34.6% agreed,and14.6% strongly agreed that they have gotten important things in life. Figure 4 shows participants' ratings for "gotten important things in life."

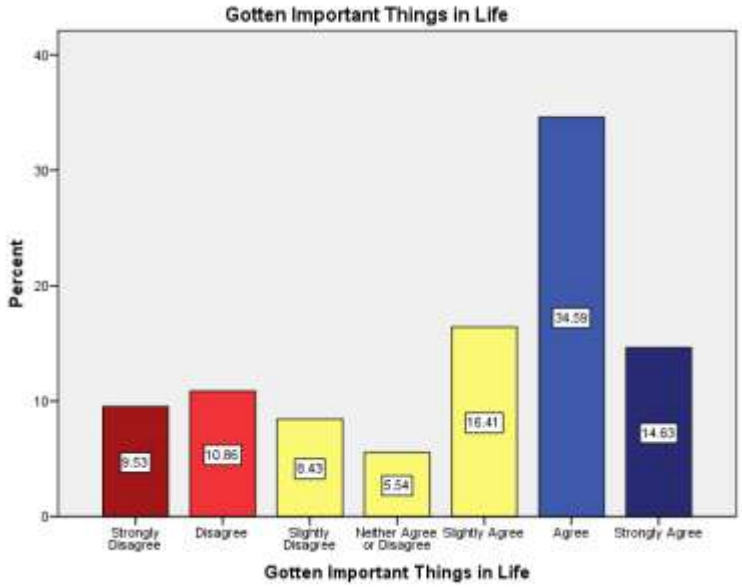

*Figure 4.*Participants' ratings for "gotten important things in life."

Change Nothing if Life is Lived Over

Data from sampled participants (n = 448) for this measure indicate a mean satisfaction of M = 3.92, SD = 2.22 (there were missing data for 859 cases among sampled participants). In addition, 21.0% strongly disagreed that their life is close to ideal, 16.7% disagreed, 9.8% slightly disagreed, 5.1% neither disagreed nor agreed, 10.0% slightly agreed, 23.4% agreed,and13.8% strongly agreed that their life is close to ideal. It is imperative to note that a missing data analysis for individual participation items could not be performed because they were categorical data. Figure 5 shows participants' ratings for "changed nothing if lived life over." It is imperative to note that a missing data analysis for satisfaction with life items could not be done because the measures used categorical variables. Missing data analysis is only done for continuous variables.

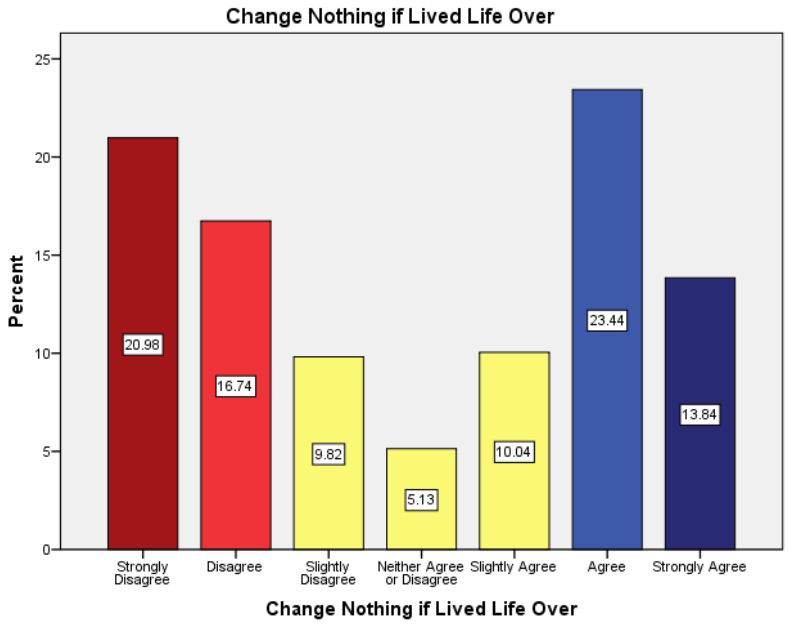

*Figure 5.*Participants' ratings for "change nothing if lived life over again."

Participation Activities

Participation activities were measured using involvement in productivity items such as home activities, social activities such as socializing with friends, and participation in out of house activities, such as getting out of house and going somewhere (Maas et al., 2007; Menon & Harrison, 2008). Missing data analysis using expectation maximization was performed to account for the missing data for these variables. The expectation maximization technique was used for treating missing data because it is appropriate for treating data that are randomly missing, which is the case with the missing data for this measurement (McBurney & White, 2009).It is imperative to note that a missing data analysis using expectation maximization or any other replacement method for satisfaction with life items could not be done because the measures used categorical variables.

Missing data analysis is only done for continuous variables (McBurney & White, 2009). For participation in out of house activities, participants (n = 1,322) had a mean of M = 1.482, SD = 0.31. For participation in productivity items, participants (n = 1,322) had a mean of M = 1.28, SD = 0.47. For participation in social activities, participants (n = 1,322) had a mean M = 2.05, SD = 0.45. For overall participation, participants had a mean M = 1.78, SD = 0.19 (n = 1322). For the sum of participation activities, participants reported a mean M = 9.71, SD = 5.61.

Productive Employment Characteristics – Pre-Injury

Hours of Paid Competitive Employment per Week – Pre-Injury Engagement in Productive Work

The average number of hours worked in paid competitive jobs per week was documented during the month just before the onset of the TBI, including hours working in illegal employment. Missing data were treated using missing data analysis (expectation maximization). Participants (n = 1322) reported a mean of 40.27 hours, SD = 7.58.

Weeks Worked Past Year – Pre-Injury Job Stability

Data were collected for the number of weeks the research participant was competitively employed during the year before the onset of TBI, including hours for illegal employment. This was used to determine the pre-injury job stability of the research participants before the onset of TBI (Murray et al., 2007; Mushkudiani et al., 2008; Narayan et al., 2006). The research participants had an average of M = 37.59 weeks, SD = 10.74, n = 1322. The expectation maximization technique was used in the analysis of missing data for this variable.

Productive Employment Characteristics: Postinjury

Hours of Paid Competitive Employment per Week – Postinjury

Data were collected for the average number of hours of paid competitive employment per week during the month before evaluation after TBI. Research participants (n = 1,322) reported an average working hours in competitive employment per week of M = 35.81, SD = 6.59.

Weeks Worked Past Year – Postinjury

Data were gathered one year after TBI about the number of weeks the research patient was involved in competitive employment. This was used to measure postinjury job stability. Research participants reported average weeks worked in the past year in competitive employment of M = 39.6, SD = 7.71. Missing data analysis for this variable was performed using expectation maximization.

Results

Research Question 1

A one-way ANOVA was used to determine whether the severity of injury (mild, moderate, or severe TBI) had an impact on engagement in productive work as measured using the hours of paid competitive work per week after TBI. There were no significant differences in engagement in productive work measured using hours of paid competitive employment per week among people with mild, moderate and severe TBI as reported by one-way ANOVA (F(2, 507) = 2.310, p>.05).

Severity of injury and job stability. A one-way ANOVA was performed to establish whether the severity of injury (mild, moderate, or severe) had an effect on job

stability as measured using weeks worked in the past year after the onset of TBI. There were no statistically significant differences in job stability among participants with mild, moderate and severe TBI as reported by one-way ANOVA (F (2, 507) = 2.664, p>.05. This finding suggests that mild, moderate, and severe TBI have the same impact on job stability. In this regard, whether a patient has mild, moderate or severe TBI, the impact on job stability is the same.

Multiple regression analysis identified the severity of TBI, measured using GCS, as a significant predictor of hours of paid competitive employment and a significant predictor of job stability with a negative coefficient. A negative coefficient in the multiple regression model implies that the severity of TBI is negatively related to engagement in productive work and job stability. It is imperative to note that the GCS is on an inversely negative scale—that is, an increase in the GCS score implies less TBI and vice versa. Therefore, this finding indicated that an increase in the severity of TBI results in a decrease in the engagement in productive work and job stability. It is evident from this finding that when severity of injury is expressed as a categorical variable (mild, moderate and severe), the one-way ANOVA suggested no impact on employment outcome. However, when the severity of injury is expressed as a continuous variable (GCS score), the multiple regression showed that the severity of injury was a significant predictor of employment outcome. This possibly suggests that patients with mild TBI are likely to have different employment outcomes when studied alone. The case is the same for patients with moderate and severe TBI. However, when they are grouped and studied together, no effect on employment is recorded despite the finding that multiple regression

using GCS score indicates severity of injury as a significant predictor of employment outcome. The underlying observation is that mild, severe, and moderate TBI have the same impact on employment outcome and that GCS score is a significant predictor of employment outcome. Therefore, Hypothesis 1 was accepted.

Research Question 2

A one-way ANOVA was used to establish whether the severity of injury (vehicle-related, fall related, violence related or other) had an impact on the participants' employment outcomes (job stability and engagement in productive work). The results indicated that a statistically significant difference existed in hours of paid competitive work per week after TBI among participants who had succumbed to the various causes of TBI (F (3, 496) = 2.673, $p< .05$) and in weeks worked in paid competitive employment in the past year (F (3, 496) = 3.892, $p<.05$). A Tukey post-hoc analysis revealed that participants with vehicle-related TBI had significantly lower job stability and engagement in productive work when compared with other causes of TBI.

The results pointed to significant differences in productive work and job stability among participants who had various causes of TBI; specifically, participants with vehicle-related TBI had significantly lower job stability and engagement in productive work when compared with other causes of TBI. Therefore, the null hypothesis was rejected.

Research Question 3

Preliminary correlations suggested an insignificant weak positive relationship between satisfaction with life and engagement in productive work and a significant

moderate relationship between satisfaction with life and job stability. The multiple regression models identified satisfaction with life as a significant predictor of engagement in productive work (with a negative coefficient) and a significant predictor of job stability (with a negative coefficient). This implies that satisfaction with life has a negative impact on employment outcomes. In other words, participants with TBI who participate more in social activities and out of house activities have lower engagement in productive work and job stability. The findings of this research suggest that an insignificant weak positive correlation existed between satisfaction with life and engagement in productive work. Satisfaction with life was also found to be a statistically significant predictor of employment outcomes, with a negative coefficient. Therefore, this hypothesis is not valid and thus, it is rejected.

Research Question 4

Preliminary correlations indicated a significant weak positive relationship between engagement in productive work and a moderate positive relationship between participation activities and job stability. Multiple regression identified participation activities as a significant predictor of both engagement in productive work (with a positive coefficient) and job stability (with a positive coefficient), which indicates that participation in activities is positively related to job stability and engagement in productive work. The findings of this research suggest that participation activity is a significant predictor of employment outcomes, with a positive coefficient, thus implying that participation activities increase job stability and engagement in productive work. Therefore, Hypothesis 4 is valid and is accepted.

Summary of Key Findings

The findings of this study have provided crucial insights with respect to the impact of TBI on productive employment in terms of job stability and engagement in productive work. With regard to the relationship between severity of TBI and engagement in productive work, the findings suggested that mild, moderate, and severe TBI had the same impact on engagement in productive work measured using hours of productive work per week (no significant differences in job stability and engagement in productive work were reported). With regard to the impact of the cause of injury on productive work, the results from the research suggested that vehicle-related TBI had significantly lower job stability and engagement in productive work when compared with other causes of TBI. The findings of the research also suggested that satisfaction with life had a negative impact on employment outcomes and that participation activities are positively related to both engagement in productive work and job stability.

Chapter 5: Discussion, Conclusions, and Recommendations

My main objective was to determine the relationship between the onset of TBI and its effect on employment outcomes, especially how TBI affects engagement in productive work. The results presented in this study have provided crucial insights into the attributes of TBI (severity, cause of injury, satisfaction with life after TBI, and participation activities after TBI) and how they affect productive employment, especially with respect to job stability and hours of paid competitive work, which constituted independent and dependent variables, respectively. The extent to which TBI patients engage in productive work was explored in this study with respect to the aforementioned independent variables; that is, the participants were grouped by the cause and severity of their injuries to determine how these variables affect their engagement in productive work. The study also explored the nature of the relationship between satisfaction with life and participation activities after TBI and engagement in productive work. Preliminary pre-injury and postinjury comparison of productive employment revealed that for all participants, regardless of the severity or cause of their TBI, their satisfaction with life, or their participation activities, there were significant differences in engagement in productive work before and after the onset of TBI, when measuring hours of paid competitive work per week.

The onset of TBI usually has an impact on how people feel, act, and think, and such impairments are perceived to cause disruptions in searching for and securing employment (Draper et al., 2009; Ruff, 2005). TBI results in a sequence of neuropsychological processes that continue for some time following the initial impact.

The development of brain damage and the following neuropsychological changes constitute a dynamic process that persists for a given duration after the occurrence of the actual TBI (Bruns & Hauser, 2003). Because of this, the findings of this study concerning the relationship between the various aspects of TBI and engagement in productive work are evaluated in light of the neuropsychological effects of TBI. Regardless of the fact that people with TBI are usually willing to resume employment, reentering or finding new employment can be extremely difficult for those having TBI. In addition, predicting employability after TBI is a challenging task because there are several variables that have an effect on employment outcomes after TBI. The use of neuropsychological effects as a reference for interpreting the findings of this study draws upon the fact that past researchers have emphasized the use of neurobehavioral problems following the occurrence of TBI, which comprise an individual's capability to process thoughts, manage emotions, communicate, and conduct oneself socially. People with neurobehavioral problems often exhibit trouble concentrating, memorizing events and things, and coordinating activities; thus, it was expected that the onset of TBI would have a negative impact on the employability of TBI patients. In addition, TBI has been established to cause reduced self-awareness, which implies that they lack the capability of accurately assessing their level of function.

The study showed that TBI has an effect on engagement in productive work. Specifically, pre-injury engagement in productive work was found to be significantly higher than postinjury engagement in productive work, suggesting that TBI reduces one's engagement in productive work when factors such as cause, severity of injury,

participation in activities, and satisfaction with life are not considered. In addition, significant differences in job stability between pre-injury and postinjury were found, which suggests that TBI has an impact on job stability. Specifically, pre-injury job stability was established to be higher than postinjury job stability when factors such as cause and severity of injury, satisfaction with life, and participation activities are not taken into consideration.

Relationship Between Severity of TBI and Employment Outcomes (Engagement in Productive Work and Job Stability)

In this research study, the severity of TBI was measured using GCS, grouping participants into mild, moderate, or severe TBI. The severity of TBI does not have an impact on engagement in productive work. These results suggest that whether the TBI is mild, moderate, or severe, the TBI's impact on engagement in productive work is the same. Similar findings were reported with regard to the relationship between severity of TBI and job stability. From these observations, it is evident that when participants are grouped into mild, moderate, and severe TBI (treated as a categorical variable), no significant differences in engagement in productive work or job stability are found. A possible explanation for this finding is that the neurobehavioral effects of mild, moderate, and severe TBI result in differential impacts on employment outcomes, particularly with regard to engagement in productive employment and job stability (Gondusky & Reiter, 2008). As a result, Hypothesis 1 was found to be valid and was thus accepted. Surprisingly, this finding is contradictory with past studies that investigated the relationship between employment outcomes and TBI severity factors. For instance,

Draper et al. (2007) used employment status as the main outcome variable, with injury severity factors being one of the potential predictors in their study. They indicated that patients with moderate to severe TBI measured using GCS risk long-term unemployment after the onset of TBI. Based on their findings, they maintained that moderate to severe TBI is characterized by impaired cognitive functioning and psychiatric symptoms that are likely to have a negative impact on employment outcomes (Draper et al., 2007).

The study showed that the severity of injury statistically significantly predicted engagement in productive work and job stability after TBI. When severity of TBI is measured using GCS (when treated as a continuous variable rather than a categorical variable), it was found to be a statistically significant predictor of engagement in productive work and job stability. This finding is consistent with past studies. For instance, Poca et al. (2012) explored the relationship between GCS score and employment status after TBI and reported a significant positive relationship between employment status and GCS score. Another previous study by Bruns and Hauser (2003) investigated the relationship between return to work and TBI severity factors and concluded that the severity of TBI is a significant predictor of the return to work.

Past studies have linked TBI severity with symptoms known to have a negative effect on employment outcomes. For instance, moderate to severe TBI injuries are characterized by physical conditions, such as numbness, weakness, and persistent headaches, as well as cognitive symptoms, such as profound confusion, combative behavior, and agitation, all of which are likely to have a negative effect on employment outcomes (Jagoda et al., 2008). Nevertheless, it is imperative to note that this study did

not control for age, prior education, disabilities, or other factors, such as substance abuse, because such information was not available in the dataset; this is a contributing factor to the differences between the current study and past research in which severity of TBI is treated as a categorical variable. Another important issue that was not factored in this study, but has been factored in past research, is time after discharge. Job stability and engagement in productive work in the data set were measured from 1 year and 1 month, respectively, before and after the onset of TBI. In the context of this research, because preliminary pre-injury and postinjury comparison of engagement in productive work indicated significant differences, it is expected that a similar relationship could be replicated in the impact of TBI severity on engagement in employment outcomes. Given the symptoms of moderate to severe TBI, one would expect that TBI severity would have a significant impact on employment outcomes. Surprisingly, the findings of this research contradict these presumptions but affirm that the GCS score is a significant predictor of engagement in productive work and job stability, which suggests that the TBI patients within a specific GCS category, such as mild TBI, are likely to have different employment outcomes depending on the score. However, when they are grouped together and compared with TBI patients in other groups, such as moderate, there are no differences in employment outcomes.

Relationship Between Cause of Injury and Employment Outcomes (Engagement in Productive Work and Job Stability)

The ICD-9-CM E-Code categories were used to group participants by cause of injury to determine which causes had an impact on engagement in productive work after

TBI. The categories of the cause of injury comprised vehicle related injuries (vehicle collisions, bicycle collisions, and railway and air transport accidents), fall related injuries, violence related injuries(self-inflicted and suicide injury, homicide, and war-related injury), and other injuries (poisoning, radiation, effects of extreme cold or heat, and struck against or by others). The findings of the current study indicated a statistically significant difference in engagement in productive work measured using hours of paid competitive employment. Specifically, participants with vehicle-related TBI had significantly lower job engagement in productive work when compared with other causes of TBI.

A potential explanation for this observation is that the neurobehavioral and cognitive impacts of the various causes of TBI result in differential impacts on employment outcome. That is, the sequelae associated with the various causes of TBI contribute to differences in engagement in productive work. Therefore, Hypothesis 2 was valid and, thus, accepted.

The findings related to Hypotheses 1 and 2 can be comprehensively interpreted in light of the behavioral, cognitive, and emotional symptoms likely to have an effect on employment outcomes of people with TBI. The underlying inference that can be made based on the findings of this study is that the behavioral, cognitive, and emotional symptoms associated with the causes and severities of TBI are related to employment outcomes after TBI (Hoge et al., 2006). As noted earlier, TBI affects an individual's feelings and thinking processes, and these are likely to have an effect on their employability. The issues that people with TBI face can be emotional, behavioral, or

cognitive. Examples of emotional issues following TBI include difficulties regulating anxiety and being susceptible to depression (Hoge et al., 2006). Examples of cognitive issues likely to affect people with TBI include issues with communication, decision-making, problem solving, memory, and attention. Behavioral issues following TBI can include difficulties initiating tasks, impulsivity, and trouble establishing and maintaining appropriate social behavior (Maas et al., 2005). In this study, TBI was characterized in terms of severity and cause of injury. It was expected that the severity and cause of injury would have an impact on engagement in productive employment when measured using hours of paid competitive work; however, it was found that the cause and severity of injury did not have a significant effect on engagement in productive work. From this observation, it can be inferred that differences exist with respect to the cognitive, behavioral, and emotional sequelae after TBI that are likely to lead to differences in engagement in productive work after TBI(Alderman et al., 2009). In this regard, based on the findings, it can be suggested that mild, moderate, and severe TBI have different cognitive, behavioral, and emotional sequelae. Similarly, it can be suggested that vehicle-related and fall-related TBI have different cognitive, behavioral, and emotional outcomes, which lead to significant differences in employment outcomes (Alderman et al., 2009).

Past studies on TBI and employment outcomes have not exclusively investigated the link between cause of injury and employment outcomes; instead, most prior research explored other factors that predict employment outcomes while controlling the cause of injury. For instance, Arango-Lasprilla et al. (2007) controlled cause of injury, employment status during admission, education level, marital status, gender, and age

while exploring the link between employment outcomes and race and ethnicity. A similar approach was adopted in other prior studies, including Jagoda et al. (2009), Rutter and Silberg (2002), and Kirkness and Thompson (2009). Thus, it is difficult to place the results of this study regarding the relationship between employment outcomes and cause of TBI in the context of the existing literature. Essentially, past studies have not considered the cause of TBI as a significant predictor of employment outcomes, resulting in its treatment mostly as a control variable. In this study, cause of TBI was treated as a predicting variable rather than a control variable. This difference in the findings of this study and prior studies can be explained by the fact that vehicle-related and other forms of injury have different levels of brain damage, resulting in different emotional, cognitive, and functional symptoms that are likely to have different effects on engagement in productive work. In addition, the findings of this study could suggest that vehicle-related TBI are the most severe forms of TBI although this was not investigated in this research, resulting in reduced engagement in productive work as indicated by the relationship between severity of TBI and engagement in productive work.

Relationship Between Satisfaction With Life After TBI and Employment Outcomes (Engagement in Productive Work and Job Stability)

Satisfaction with life was measured using five items, which included the statements “my life is close to ideal,”“my life conditions are excellent,”“I am satisfied with my life,”“I have obtained the most important things in life,” and “I would change nothing if I lived my life over again.” These subscales were summed to constitute the Satisfaction With Life Scale. The study showed a weak positive relationship between

satisfaction with life and hours of paid competitive employment per week. From the multiple regression analysis regarding the predictors of engagement in productive work, it was established that satisfaction with life statistically significantly predicted engagement in productive work with a negative coefficient. From the findings of this study, it can be inferred that the degree to which an individual is satisfied with life after TBI can be used to predict engagement in productive work and job stability after TBI.

It was expected that satisfaction with life after TBI would be positively related to engagement in productive work. Satisfaction with life is defined as an individual's perceptions of his or her position in life in terms of values, cultural systems, concerns, goals, and expectations. Prior research established that satisfaction with life depends significantly on the availability of social contact and support (Gondusky & Reiter, 2008). With the onset of TBI, relationships tend to fade, and people who have succumbed to TBI usually have difficulty finding new relationships because of their constrained interactions with others. In addition, limited mobility hampers the opportunity to make contact with new people, and that results in a negative impact on satisfaction with life(Rogers & Read, 2007). In the context of this study, satisfaction with life was found to have a negative coefficient when predicting employment outcomes, implying that life satisfaction reduces engagement in productive work. In this line of reasoning, the findings reported in this study could suggest that engagement in productive work after TBI increases satisfaction with life after TBI. This study's results indicated that engaging in productive employment may increase satisfaction with life because productive work affects the factors associated with increased satisfaction with life, such as opportunities to meet and socialize with new

people. Engaging in paid competitive employment also increases financial security and standards of living, which have been linked to satisfaction with life(Alderman et al., 2009).

Past studies relating to the link between satisfaction with life and employment outcomes have reported mixed results, with some reporting a relationship, whereas others report no relationship between the two variables. For instance, Plata et al. (2011) found no relationship between subjective satisfaction with life and employment status following TBI. Draper et al. (2009) and Gennarelli et al. (2005) reported a relationship between satisfaction with life and employment outcomes following TBI. Specifically, the authors found that TBI normally results in a loss of relationships and that establishing new relationships is relatively difficult, as there is limited interaction with others (Draper et al., 2009; Gennarelli et al., 2005). Additionally, limited mobility further hampers the opportunity to make contact with other people and work effectively (Ruff, 2005). Employment has been shown to be an important determinant of satisfaction with life, as it has an impact on other crucial variables, such as opportunities to meet new people and financial security (Gennarelli et al., 2005). Individuals suffering from TBI (severe to moderate) are highly likely to be laid off from their jobs (Draper et al., 2009). In addition, leisure disability is also an outcome of TBI, whereby individuals with severe to moderate TBI tend to have significantly lower “quality of leisure activities” following their head injury (Korczak & Timmann, 2007). Because there is no consistency in the literature regarding the relationship between satisfaction with life and employment outcomes after

TBI, the findings reported in this study add to the existing literature that indicates that satisfaction with life can predict the level of engagement in productive work.

It is crucial to recognize the complex relationship between employment outcomes and satisfaction with life in the sense that it is difficult to determine whether employment causes higher satisfaction with life or vice versa; that is, people with low life satisfaction are less likely to be employed. Therefore, it is difficult to ascertain whether low life satisfaction negatively affects employment outcomes or whether negative employment outcomes after TBI lead to low life satisfaction.

Relationship Between Participation Activities and Employment Outcomes (Engagement in Productive Work and Job Stability After TBI)

Participation activities were measured by the extent of involvement in activities, including out of house activities, productivity activities, social activities, and overall participation. These subscales were summed to measure the overall extent to which participants took part in all types of activities. The study suggested a weak positive relationship between participation activities and hours of paid competitive work per week after TBI. This relationship is significant, thus implying that taking part in participation activities results in a slight improvement in the hours of paid competitive work after injury and contributes to engagement in productive work.

Participation in activities following TBI has the main purpose of ensuring that people who sustained head injuries are involved in their homes and communities (Armonda et al., 2006). Consequently, these participation activities try to make sense of the patient's daily life as well as the things that they consider important in their own daily

lives. Participation activities could include home activities, school activities, and being involved in recreational activities, such as taking a walk or going shopping, or participation in community related activities such as religious services, watching sports, watching movies, taking part in sporting activities, and eating out (Armonda et al., 2006). Participation activities are an instance of a community integration measure, whereby participation is perceived as involvement in activities that are mainly social, role functioning, recreational, or related to the household, among others (Gondusky & Reiter, 2008). From this study, it can be inferred that participation activities after TBI are likely to improve the cognitive, emotional, and physical sequelae associated with the onset of TBI, thus resulting in an improvement in employment outcomes. An explanation for this observed relationship is that engaging in participation activities is likely to increase the chances of engaging in productive employment; that is, people with head injuries who engage in community participation are more likely to be employed when compared to those who do not take part in such community activities (Gondusky & Reiter, 2008).

Lewis (2009) found that participation in extensive day treatment programs and social activities significantly improved employment outcomes, particularly engagement in productive work. Overall, the findings of the research suggest that participation in social activities, out of house activities, and productivity activities has an impact on the employment outcomes following the onset of TBI, with regard to engagement in productive work.

Implications

Findings from this research have three broad implications, which include implications for employers, implications for service providers, and implications for policy makers. The following subsections discuss in detail the implications of the findings in this research.

Implications for Employers

The findings of this study provide significant insights for employers who have employees who have sustained head injuries. First, the preliminary findings suggest that the onset of TBI has an impact on engagement in productive work and job stability. Thus, productivity and job stability should be a major concern for employers if their employees sustain traumatic head injuries. These sequelae have an impact on job stability and hours of engagement in productive work.

The second crucial implication for employers is that the cause and severity of injury have an impact on engagement in productive work. In this regard, while employing people who have sustained head injuries, employers have to consider the cause and severity of TBI related to productive work and job stability. When a person succumbs to mild, moderate, or severe head injury, the impact on an employee's productivity varies (Walker et al., 2007). Similarly, the cause of injury should also be considered when an employee has sustained head injuries. It is recommended that employers should use the cause of injury and severity of injury as a factor for determining the productivity of a potential employee who has sustained head injuries (Chang et al., 2009).

Third, an implication from the findings is that increased levels of satisfaction with life and participation activities are likely to increase engagement in productive work. To this end, it is recommended that employers provide avenues at their workplaces that can help people who have sustained injuries to increase their life satisfaction and participate in activities. Such avenues could include opportunities to meet and socialize with new people, placing those with head injuries in work positions that could help them interact with other people, and placing those with TBI in outdoor work roles. Outdoor and participation activities have been established to help improve life satisfaction and participation activities, which have been established to help increase work productivity (McAllister, 2008; Walker et al., 2007).

Implications for Service Providers

In addition to its implications for employers, the findings of this research also provide crucial insights that might benefit service providers, particularly TBI rehabilitation centers. First, the findings suggest engagement in productive employment is positively related to satisfaction with life. As a result, TBI rehabilitation centers should not only focus on community integration efforts but also help their participants to secure meaningful, paid, and competitive employment. In addition, TBI rehabilitation centers should measure the effectiveness of their rehabilitation initiatives using employment outcomes. TBI rehabilitation centers should acknowledge that despite the fact that people with TBI usually want to be engaged in meaningful employment, finding new employment or resuming previous work could be challenging (Brain Trauma Foundation, 2007). As a result, TBI rehabilitation centers should play a forefront role in helping their

participants resume or secure new employment, as employment has been found to be crucial in improving their well-being in terms of life satisfaction. In an attempt to improve the employability of their participants, TBI rehabilitation centers should embark on initiatives that could increase their participants' life satisfaction as well as increase their capacity to participate in community and other social activities (Brain Trauma Foundation, 2007). For instance, social support can be enhanced by providing group therapy to help promote cognitive, social, and behavioral skills that can boost the employability of their participants. Group therapy can empower people with TBI, as they get peer support while working towards becoming re-employed or finding new employment.

Implications for Policy Makers

The findings of this study can be used to advocate for certain policies to be adopted to accommodate people with TBI at work places. First, the results suggest that the severity of injury is not related to engagement in productive work. Thus, employers must refrain from discriminating against employees with regard to the severity of their injury. Additionally, policy makers are advised to enact laws and regulations that prevent employers from discriminating against people who have succumbed to TBI with regard to how severe their TBI is (Armonda et al., 2006). The findings also suggest that the onset of TBI is not related to job stability or productivity; as a result, policy makers are advised to enact laws that secure the employment of an individual in the event that he or she sustains head injuries, whether mild, moderate, or severe, or whether caused by falls or vehicle-related accidents.

Second, the findings of this study suggest that engagement in productive work improves satisfaction with life and participation in community activities. To this end, policy makers are advised to adopt laws and regulations that compel employers to accommodate people who have succumbed to TBI, in the same way as they accommodate people with other disabilities. Essentially, employers should strive to help their employees with TBI to have a smooth transition when resuming their community activities. This will not only help them in improving their life satisfaction but also improve their productivity (McAllister, 2008).

Recommendations for Future Research

A number of aspects relating to TBI have not been clearly investigated in this study. First, productive employment and job stability were measured in terms of hours of paid competitive work per week and number of weeks engaged in paid work for the past year during pre-injury and postinjury periods. It is evident that engagement in productive work and job stability depend on several other factors, such as educational level, disabilities, and substance abuse, which were not controlled in this study. Thus, this study might not have captured productivity accurately. Accordingly, future research should investigate productivity and employability beyond just the number of hours that an individual spends in productive work.

Limitations of the Study

The primary limitation of this study is related to several cases of missing data in the data set from the TBI Model Systems. As a result, the number of valid cases for each variable was relatively small. It is imperative to know that it was difficult to come across

paired variables for a single analysis. For instance, there were very few instances of paired variables for paid competitive work and satisfaction with life or participation activities; as a result, such valid paired cases were relatively few. It is likely that the low frequency of paired variables available for analysis may have affected the significance of the findings reported in this study. In addition, this study did not focus on the effects of age, race, and disability on TBI, and these factors affect the relationship between the onset of TBI and employment outcomes.

Conclusion

My main objective in this study was to determine the relationship between the onset of TBI and how it affects employment outcomes, especially how TBI affects engagement in productive work. The results presented in this study have provided crucial insights regarding the attributes of TBI (severity, cause of injury, satisfaction with life after TBI, and participation activities after TBI) and how they affect productive employment, especially with respect to job stability and hours of paid competitive work. The objectives of this research were met, and the research questions were answered. The results indicated that there were significant differences in job stability and engagement in productive work between pre-injury and postinjury, which suggests that TBI has an impact on job stability. The results of this research also revealed that there were no statistically significant differences in engagement in productive work between participants with mild, moderate, or severe TBI. The study revealed significant differences in engagement in productive work when participants are grouped in accordance with the cause of injury, which suggests that the cause of injury has an impact

on engagement in productive work. In addition, from the findings of this study, it can be inferred that the degree to which an individual is satisfied with life after TBI has an impact on his or her engagement in productive work. Participation activities, GCS score, and satisfaction with life were found to be significant predictors of employment outcomes. The results of this research provided crucial insights for employers, service providers, and policy makers with respect to how they can approach the issue of TBI and employment outcomes. For employers, it is crucial to note that TBI sequelae have an impact on job stability and hours of engagement in productive work; therefore, employers have to consider the cause and severity of TBI related to productive work and job stability. In light thereof, employers are encouraged to provide avenues at their workplaces that can help people who have sustained injuries to increase their life satisfaction and participate in activities, such as opportunities to meet and socialize with new people. For TBI service providers, TBI rehabilitation centers should not only focus on community integration efforts but also help their participants to secure meaningful, paid, and competitive employment. In addition, based on the findings of this research, policy makers are advised to enact laws that secure the employment of an individual in the event that he or she sustains head injuries, whether mild, moderate, or severe, or whether caused by falls or vehicle-related accidents.

References

Alderman, N., Burgess, P., Knight, C., & Henman, C. (2009). Ecological validity of a simplifiedversion of the multiple errands shopping test. *Journal of the Internaltional Neuropsychological Society, 9,* 31-44. doi: 10.1080/13803395.2013.776011

Arango-Lasprilla, J., Ketchum, J., & Williams, K. (2008). Racial differences in employment outcomes after traumatic brain injury. *Archives of Physical Medicineand Rehabilitation*, *89*(5), 56-63.doi: 10.1016/j.apmr.2008.02.012

Arango-Lasprilla, J., Rosenthal, M., & Deluca, J. (2007). Functional outcomes from inpatient rehabilitation after Traumatic Brain Injury. *Archives of Physical Medicine and Rehabilitation*, *88*(1), 11-18.doi: 10.1080/13854046.2010.532813

Arciniegas, D. (2009). Designing clinical trials to improve neurobehavioral outcome after traumatic brain injury: From bench to bedside. *Critical Care Medicine*, *37*(2), 784-785. doi: 10.1097/CCM.0b013e3181959e46

Arciniegas, D., & Mcallister, T. (2008). Neurobehavioral management of traumatic brain injury in the critical care setting. *Critical Care Clinics*, *24*(4), 737-765. doi: 10.1016/j.ccc.2008.06.001

Arciniegas, D., Lauterbach, E., & Anderson, K. (2009). The differential diagnosis ofpseudobulbar affect (PBA): Distinguishing PBA from disorders of mood and affect. *Current Psychiatry Reports, 5,* 391–399. Retrieved from http://www.currentpsychiatry.com/

Armonda, R., Bell, R., Vo, A., Ling, G., DeGraba, T.,Crandall, B.,Ecklund J., Campbell, W. (2006). Wartimetraumatic cerebral vasospasm: Recent review of combat casualties. *Journal ofNeurosurgery, 59,* 1215–1225.doi:10.1227/01.NEU.0000249190.46033.94

Ashman, T., Spielman, L., & Hibbard, M. (2008). Psychiatric challenges in the first 6 years aftertraumatic brain injury: Cross-sequential analyses of axis I disorders.*Archieves ofPhysical Medicine andRehabilitation, 85,* 36–42. doi: http://dx.doi.org/10.1016/j.apmr.2003.08.117

Assa, Y., & Pasternak, O. (2008). Diffusion tensor imaging (DTI)-based white matter mappingin brain research: A review. *Journal of Molecular Neuroscience*, *34*(1), 1133-1144. Retrieved from PubMed.

Balestreri, M., Czosnyka, M., Chatfield, D. A., Steiner, L. A., Schmidt, E. A., Smielewski, P., Pickard, J. D. (2007).Predictive value of Glasgow Coma Scale after brain trauma: Change in trend overthe past ten years. *Journal of Neurology, Neurosurgery & Psychiatry,75*, 161-162. Retrieved from http://jnnp.bmj.com/content/75/1/161.long

Bandura, A. (1997). *Self-efficacy: The exercise of control.* New York, NY: Worth.

Bazarian, J., Zhong, J., Blyth, B., Zhu, T., Kavcic, V., & Peterson, D. (2007). Diffusion tensor imaging detects clinically important axonal damage after mild traumatic brain injury: A pilot study. *Journal of Neurotrauma*, *24*(9), 1447-1459. doi: 10.1089/neu.2007.0241

Bennett, A., Lesch, K., & Heils, A. (2008). Early experience and serotonin transporter genevariation interact to influence primate CNS function. *Molecular Psychiatry,7,* 118-122.doi: 10.1038/ sj/mp/4000949

Bercaw, E., Hanks, R., Millis, S., & Gola, T. (2011). Changes in neuropsychological performance after traumatic brain injury from inpatient rehabilitation to 1-year follow-up in predicting 2-year functional outcomes. *Clinical Neoropsychology*, *25*(1), 72-89.doi: 10.1080/13854046.2010.532813

Bhatia, A., & Gupta, K. (2007). Neuromonitoring in the intensive care unit:Intracranial pressure and cerebral blood flow monitoring. *Intensive Care Medicine*, *33*(7), 89-111.doi: 10.1007/s00134-007-0678-z

Bhullar, I., Roberts, E., Brown, L., & Lipei, H. (2010). The effectof age on blunt traumatic brain-injured patients. *American Surgery, 76*(9), 966-968. Retrieved from PubMed.

Bjork, J., & Grant, S. (2009). Does traumatic brain injury increase risk for substance abuse?*Journal of Neurotrauma*, *26*(7), 1077–1082. doi: 10.1089/neu.2008.0849

Bouwens, S., Van Heugten, C., Aalten, P., Wolfs, C., Baarends, E.,Van Menxel, D.(2008). Relationship between measures of dementia severity and observation of dailylife functioning as measured with the assessment of motor and process skills (AMPS).*Dementia and Geriatric Cognitive Disorders,25,* 81-87.Retrieved from PubMed.

Brain Trauma Foundation. (2007). Joint section on neurotrauma and critical care: Guidelines for the management of severe traumatic brain injury (3rd ed.).*Journal of Neurotrauma*, *24*(Suppl 1), 12-25.Retrieved from PubMed.

Bruns, J. J., & Hauser, W. (2008). The epidemiology of traumatic brain injury: A review. *Epilepsia*, *44*, 2-10.doi: 10.1097/HTR.0b013e3181ccc8b4

Butcher, N., & Mineka, S. (2007). *Abnormal psychology.* Toronto, Canada: Pearson.

Cardoso, E., Romero, M., Chan, F., Dutta, & Rahimi, M. (2007). Disparities in vocational rehabilitation services and outcomes for hispanic clients with Traumatic Brain Injury: Do they exist? *Journal of Head Trauma Rehabilitation*, *22*(2), 84-94. doi: 10.1097/01.HTR.0000265096.44683.6b

Chang, J. J., Youn, T. S., Benson, D., Mattick, H., Andrade, N., Harper, C. R.,Diaz-Arrastia, R. R.(2009). Physiologic and functional outcome correlates of brain tissue hypoxia in traumatic brain injury. *Critical Care Medicine*, *37*(1), 283-290. doi: 10.1097/CCM.0b013e318192fbd7

Chaytor, N., Temkin, N., Machamer, J., & Dikmen, S. (2007). The ecological validity of neuropsychological assessment and the role of depressive symptoms in moderate to severe traumatic brain injury. *Journal of the International Neuropsychological Society*, *13*(3), 12-20. doi: 10.1017/S1355617707070592

Clark, S., Bayir, H., Chu, T., Alber, M., Kochanek, M., & Watkins, C. (2008). Autophagy is increased in mice after traumatic brain injury and is detectable in human brain after trauma and critical illness. *Autophagy*, *4*(1), 88–90. Retrieved from PubMed.

Corrigan, J., & Bogner, J. (2007). Interventions to promote retention in substance abuse treatment. *Brain Injury, 21*(4), 343–356.doi:10.1080/02699050701253103

Corrigan, J., & Bogner, J. (2007). Screening and identification of TBI. *Journal of Head Trauma Rehabiitation, 22*(6), 315-317. Retrieved from http://journals.lww.com/headtraumarehab/Pages/default.aspx

Czarnik, T., Gawda, R., Latk, D., Kolodziej, W., & Sznajd-Weron, K. (2007). Noninvasive measurement of intracranial pressure: Is it possible? *Journal of Traumaand Acute Care Surgery*, *62*(1), 207–211.Retrieved from PubMed.

Deb, S., & Burns, J. (2007). Neuropsychiatric consequenc-es of traumatic brain injury: A comparison between two age groups. *Brain Injury, 21*(3), 301-307. doi: 10.3389/fneur.2013.00157

Ding, K., de la Plata, C. M., Wang, J. Y., Mumphrey, M., Moore, C., Harper, C., ... & Diaz-Arrastia, R. (2008). Cerebral atrophy after traumatic white matter injury: Correlation with acute neuroimaging and outcome. *Journal of Neurotrauma,25,*1433-1440. doi: 10.1089/neu.2008.0683

Draper, K., Ponsford, J., & Schönberger, M. (2007). Psy-chosocial and emotional outcomes 10 years following traumatic brain injury. *Journal of Head Trauma and Rehabilitation, 22*(5), 278-287.Retrieved from PubMed.

Elaine, G., Le Blanc, J., & Feyz, M. (2008). Long-term outcome after severe traumatic brain injury: The McGill Multidisciplinary Prospective Outcome Study. *Journal of Head Trauma Rehabilitation, 23*(5), 294–303. doi: 10.1097/01.HTR.0000336842.53338.f4

Eslinger, P., Zappala, G., Chakara, F., & Barrett, A. (2007). Cognitive impairments after traumatic TBI. In N. Zasler, D. Katz, & R. Zafonte (Eds.), *Brain injury medicine: Principles and practice* (pp. 779-790). New York, NY: Demos Medical Publishing.

Fann, J., Burington, B., & Leonetti, A. (2008). Psychiatric illness following traumatic braininjury in an adult health maintenance organization population. *Archives of GeneralPsychiatry, 61*, 53–61.Retrieved from PubMed.

Felicetti, T. (2009). Falling in aging brain injury population: Analysis of a specific fall prevention protocol in a postacute brain injury rehabilitation.*Professional Case Management, 14*(3), 158-160.doi: 10.1097/01.PCAMA.0000352529.94964.27

Gabella, B., Mangione, E., Hedegaard, H., & Kelly, J. (2007). Comparison of nursing home residents with and without traumatic brain injury: Use of the minimum data set. *Journal of Head Trauma Rehabilitation, 22*(6), 368-376.Retrieved from PubMed.

Gennarelli, T., Graham, D., Silver, J., McAllister, T., & Yudofsky, S. (2009). *Neuropsychiatry of traumatic brain injury.* Washington, DC: American Psychiatric Press.

German Society for Trauma Surgery. (2008). Head injury and outcome—What influence do concomitant injuries have? *Journal of Trauma*, *65*(5), 1036–1044. doi: 10.1097/TA.0b013e318184ee48

Gondusky, J., & Reiter, M. (2008). Protecting military convoys in Iraq: An examination of battle injuries sustained by a mechanized battalion during Operation Iraqi Freedom II. *Military Medicine, 170*(6), 174-184.Retrieved from PubMed.

Harhangi, S., Kompanje, O., Leebeek, G., & Maas, R. (2008). Coagulation disorders after traumatic brain injury. *Acta Neurochirurgica, 150,* 165-175.doi: 10.1007/s00701-007-1475-8

Hart, T., Whyte, J., & Millis, S. (2006). Dimensions of disordered attention in traumatic braininjury: Further validation of the Moss Attention Rating Scale. *Archives of PhysicalMedicine Rehabilitation, 87,* 647-655.
doi: 10.1016/j.apmr.2006.01.016

Hoge, C., Auchterloine, J., & Milliken, C. (2006). Mental health problems, use of mental healthservices, and attrition from military service after returning from deployment to Iraq orAfghanistan. *Journal of the American Medical Association,295,* 1023-1032.
Retrieved from http://jama.jamanetwork.com/article.aspx?articleid=202463

Hou, D., Tong, K., Ashwal, S., Oyoyo, U., Joo, E., & Shutter, L. (2007). Diffusion-weighted magnetic resonance imaging improves outcome prediction in adult traumatic brain injury. *Journal of Neurotrauma, 24,* 1558-1569.
doi: 10.1089/neu.2007.0494

Hudak, A., Hynan, L., Harper, C., & Diaz-Arrastia, R. (2011). Association of depressive symptoms with functional outcome after Traumatic Brain Injury. *Journal of Head Trauma Rehabilitation, 27*(2), 45-56.Retrieved from PubMed.

Hudak, A., Warner, M., Plata, C., Moore, C., Harper, C., & Diaz-Arrastia, R. (2011). Brain morphometry changes and depressive symptoms after traumatic brain injury. *Psychiatry Research: Neuroimaging, 191*(3), 160-165.Retrieved from PubMed.

Ishibe, N., Wlodarczyk, R., & Fulco, C. (2009). Overview of the Institute of Medicine's Committee search strategy and review process for Gulf War and health: Long-term consequences of traumatic brain injury. *Journal of Head Trauma Rehabilitational, 24*(6), 424–429.Retrieved from PubMed.

Iverson, G. (2010). Mild traumatic brain injury meta-analyses can obscure individual differences. *Brain Injury, 24*(10), 1246–1255.Retrieved from PubMed.

Jagoda, A., Bazarian, J., & Bruns, J. J. (2009). Clinical policy: Neuroimaging and decisionmaking in adult mild traumatic brain injury in the acute setting. *Journal of Emergency Nursing, 35*(2), 35-40. Retrieved from PubMed.

Jang, H., Kim, D., Son, S., Cho, Y. W., Kim, S. H., Kim, O. L., &Ahn, S. H. (2009). Clinical application of tensor tractography for elucidation of the causes of motor weakness in patients with traumatic brain injury. *Neurorehabilitation*, *24*(3), 131-140.doi: 10.3233/NRE-2009-0478.

Jellinger, K. (2010). Head injury and dementia. *Current Opinion in Neurology,17*,719–723.Retrieved from PubMed.

Jiang, J., Feng, H., & Fu, Z. (2007). Violent trauma in China: Report of 2254 cases. *Surgury of Neurology, 68*(Suppl 2), 2–5. Retrieved from PubMed.

Kennedy, J., Jaffee, M., Leskin, G., Stokes, J., Leal, F., & Fitzpatrick, P. (2007). Posttraumaticstress disorder and posttraumatic stress disorder-like symptoms and mild traumatic braininjury. *Journal of Rehabilitational. Research and Development, 44*, 895–920. Retrieved from http://www.rehab.research.va.gov/jour/07/44/7/Kennedy.html

Kim, E., Lauterbach, E., Reeve, A., Arciniegas, D., Coburn, K.,Mendez, M. (2007). Neuropsychiatric complications of traumatic brain injury: Acritical review of the literature (a report by the ANPA Committee on Research). *Journal of Neuropsychiatry& Clinical Neurosciences*, *19*(2), 106-127.Retrieved from PubMed.

Kirkness, C., & Thompson, H. (2009). Brain tissue oxygen monitoring in traumatic brain injury: Cornerstone of care or another brick in the wall? *Critical Care Medicine, 37*(1), 371-372. Retrieved from PubMed.

Kirkness, C., Burr, R., Cain, K., Newell, D., & Mitchell, P. (2008). The impact of a highly visible display of cerebral perfusion pressure on outcome in individuals with cerebral aneurysms. *Heart & Lung: The Journal of Acute and Critical Care, 37*(3), 227-237.doi: 10.1016/j.hrtlng.2007.05.015

Konczak, J., & Timmann, D. (2007). The outcome of damage to the cerebellum on sensorimotor and cognitive function in children and adolescents. *Neuroscience and Biobehavioral Reviews, 31*(8), 1101–1113.Retrieved from PubMed.

Lai, Y., Hickey, W., & Chen, Y. (2008). Autophagy is increased after traumatic brain injury in mice and is partially inhibited by the antioxidant gamma-

glutamylcysteinyl ethyl ester. *Journal of Cerebral Blood Flow &Metabolism, 28,* 540–550. Retrieved from PubMed.

Langlois, J., Rutland-Brown, W., & Thomas, K. (2007). *Traumatic Brain Injury in the United States: Emergency Department Visits, Hospitalizations and Deaths.* Atlanta, GA: Centers for Disease Control and Prevention, National Center for Injury Prevention and Control.Retrieved from PubMed.

Lehtonen, S., Stringer, A., & Millis, S. (2007). Neuropsychological outcome and community reintegration following traumatic brain injury: The impact of frontal and non-frontal lesions.*Brain Injury,19,* 239-256.Retrieved from PubMed.

Lewis, A. (2009). Disability disparities:Abeginning model. *Disability and Rehabilitation*,*31*(14), 220-230. Retrieved from PubMed.

Li, X., & Feng, D. (2009). Diffuse axonal injury: Novel insights into detection and treatment. *Journal of Clinical Neuroscience*, *16*(5), 147-155. doi: 10.1016/j.jocn.2008.08.005

Maas, A., Hukkelhoven, C., Marshal, I. L., & Steyerberg, E. (2005). Prediction of outcome intraumatic brain injury with computed tomographic characteristics: Acomparison betweenthe computed tomographic classification and combinations of computed tomographicpredictors. *Neurosurgery, 57*, 1173–1182. doi: 10.1227/01.NEU.0000186013.63046.6B

Maas, A., Marmarou, A., Murray, D., Teasdale, G., & Steyerberg, E. (2007). Prognosis and clinical trial design in traumatic brain injury: The IMPACT study. *Neurotrauma*, *24*(2), 232–238.

doi: 10.1016/j.nurt.2009.10.020

Mainio, A., Kyllönen, T., Viilo, K., Hakko, H., Särkioja, T., & Räsänen, P. (2007). Traumatic brain injury, psychiatric disorders and suicide: A population-based study of suicide victims during the years 1988–2004 in northern Finland. *Brain Injury*, *21*(8), 851–855.

doi: 10.1080/02699050701504265

Mathias, J., & Wheaton, P. (2007). Changes in attention and information-processing speedfollowing severe traumatic brain injury: a meta-analytic review. *Neuropsychology*,*21*, 212–223.

doi: 10.1037/0894-4105.21.2.212

McAllister, T. (2008). Neurobehavioral sequelae of traumatic brain injury: Evaluation and management. *World Psychiatry, 7*(1), 3–10.

Retrieved from http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2327235/

McBurney, D., & White, T. (2009). *Research methods.* New York, NY: Cengage Learning.

McHugh, S., Engel, C., & Butcher, I. (2007). Prognostic value of secondary insults in traumatic brain injury: Results from the IMPACT study. *Journal of Neurotrauma , 24*(2), 287–293.

Retrieved from http://www.tbi-impact.org/?p=publications

Menon, D., & Harrison, D. (2008). Prognostic modelling in traumatic brain injury. *British Medical Journal*, *336*(7641), 397–398.

doi: http://dx.doi.org/10.1136/bmj.39461.616991.80

Menon, D., Schwab, K., Wright, D., & Maas, A. (2010). Position statement: Definition of traumatic brain injury: Demographics and clinical assessment working group of the international and interagency initiative toward common data elements for research on traumatic brain injury and psychological health. *Archives of Physical Medicine Rehabilitation, 91*(11), 1637-40. doi: 10.1016/j.apmr.2010.05.017

Mitchell, M., & Janina, J. (2009). *Research design explained.* New York, NY: Cengage Learning.

Moss, K., & Burris, S. (2007). The employment discrimination provisions of the Americans with Disability Act: Implementation and impact. *Preventive Cardiology*, *2007,*88-101. Retrieved from PubMed.

MRC CRASH Trial Collaborators. (2008). Predicting outcome after traumatic brain injury: Practical prognostic models based on large cohort of international patients. *British Medical Journal, 336*(7641), 425–429. Retrieved from PubMed.

Murray, G., Butcher, I., & McHugh, S. (2007). Multivariable prognostic analysis in traumatic brain injury: Results from the IMPACT study. *Neurotrauma*, *24*(2), 329–337. Retrieved from PubMed.

Mushkudiani, A., Hukkelhoven, C., & Hernández, V. (2008). A systematic review finds methodological improvements necessary for prognostic models in determining traumatic brain injury outcomes. *Journal of Clinical Epidemiology, 61*(4), 331–343. Retrieved from PubMed.

Nampiaparampil, D. (2008). Prevalence of chronic pain after traumatic brain injury: A systematic review. *JAMA, 300*(6), 711–719. Retrieved from PubMed.

NAN Policy and Planning Committee. (2009). Recommendations for diagnosing a mild traumatic brain injury: A National Academy of Neuropsychology education paper. *Archives of Clinical Neuropsychology, 24*(1), 3–10. doi: 10.1093/arclin/acp006

Narayan, R., Michel, M., Ansell, & Baethmann, A. (2006). Clinical trials in head injury. *Journal ofNeurotrauma,19*, 503–557. Retrieved from PubMed.

Ness, A. (2010). *Methods in psychological research.*Thousand Oaks, CA: Sage.

Nichol, A., Higgins, A., Gabbe, B., Murray, L., Cooper, D., & Cameron, P. (2011). Measuring functional and quality of life outcomes following major head injury: Common scales and checklists. *Injury, 42*(3), 281-287.Retrieved from PubMed.

O'Jile, J., Ryan, L., & Betz, B. (2006). Information processing following mild head injury.*Archives of Clinical Neuropsychology,21*(3), 293–296. Retrieved from PubMed.

Owen, M., & Coleman, R. (2008). Functional neuroimaging of the vegetative state. *Nature Reviews Neuroscience,9*(3), 235–243. Retrieved from PubMed.

Pagulayan, K., N. T., Machamer, J., & Dikmen, S. (2007). The measurement and magnitude of awareness difficulties after traumatic brain injury: A longitudinal study. *Journal of the International Neuropsychological Society, 13*(4), 1-12. Retrieved from PubMed.

Plata, M., Garce, J., Kojori, S., Grinnan, J., Krishnan, K., & Pidikiti, R. (2011). Deficits in functional connectivity of hippocampal and frontal lobe circuits after traumatic axonal injury. *Archives of Neurology*, *68*(1), 74-84. Retrieved from PubMed.

Poca, A., Sahuquillo, J., Topczewski, T., Penarrubia, J., & Muns, A. (2007). Is intracranial pressure monitoring in the epidural space reliable? Fact and fiction. *Journal of Neurosurgery*, *106*(4), 548-556. Retrieved from PubMed.

Ponsford, J., Whelan-Goodinson, R., & Bahar-Fuchs, A. (2007). Alcohol and drug use following traumatic brain injury: A prospective study. *Brain Injury*, *21*(13/14), 1385–1392.

Powell, H., Parker, J., Alexander, D., Symms, M., & Boulby, P. (2008). Imaging language pathways predicts postoperative naming deficits. *Journal of Neurology,Neurosurgery and Psychiatry*, *79*(3), 144-155. Retrieved from PubMed.

Powell, J., Temkin, N., Machamer, J., & Dikmen, S. (2007). Gaining insight into patients' perspectives on participation in home management activities after traumatic brain injury. *American Journal of Occupational Therapy*, *61*(3), 269-279. Retrieved from PubMed.

Ramsey, A., Sharer, W., L'Eplattenier, B., & Mastrangelo, L. (2009). *Working in the archives:Practical research methods for rhetoric and composition.*New York, NY: SIU Press.

Rogers, J., & Read, C. (2007). Psychiatric comorbidity following traumatic brain injury. *Brain Injury*, *21*(13/14), 30-35. Retrieved from PubMed.

Ruff, R. (2008). Two decades of advances in understanding of mild traumatic brain injury. *Journal of Head Trauma Rehabilitation, 20*(1), 5–18.

Rutter, M., & Silberg, J. (2010). Gene-environment interplay in relation to emotional and behavioral disturbance. *Annual Review Psychology, 53*, 463-490.

Saatman, K. E., Duhaime, A.-C., Bullock, R., Maas, A. I., Valadka, A., & Manley, G. T. (2008). Classification of traumatic brain injury for targeted therapies. *Journal of Neurotrauma, 25*(7), 719–738. Retrieved from PubMed.

SAFE Study Investigators. (2007). Saline or albumin for fluid resuscitation in patients with traumatic brain injury. *New England Journal of Medicine, 357*(9), 874–884. Retrieved from PubMed.

Schwab, K., Ivins, B., & Cramer, G. (2007). Screening for traumatic brain injury in troops returning from deployment in Afghanistan and Iraq: Initial investigation of the usefulness of a short screening tool for traumatic brain injury. *Journal of Head Trauma Rehabilitation, 22*(6), 315-317. Retrieved from PubMed.

Selassie, A., Zaloshnja, E., Langlois, A., Miller, T., Jones, P., & Steiner, C. (2008). Incidence of long-term disability following traumatic brain injury hospitalization, United States, 2003. *Journal of Head Trauma Rehabilitation*, *23*(2), 123-131.

Servadei, F., Compagnone, C., & Sahuquillo, J. (2007). The role of surgery in traumatic brain injury. *Current Opinion in Critical Care*, *13*(2), 163–168. Retrieved from PubMed.

Shafi, S., Diza-Arrastia, R., Madden, C., & Gentilello, L. (2008). Intracranial pressure monitoring in brain-injured patients is associated with worsening of survival. *Journal of Trauma*, *64*(2), 335-340.

Sherer, M., Struchen, M., Yablon, S., Wang, Y., & Nick, T. (2008). Comparison of indices of traumatic brain injury severity: Glasgow Coma Scale, length of coma and post-traumatic amnesia. *Neurosurg Psychiatry*, *79*(6), 678-85. Retrieved from PubMed.

Sherri, J. (2011). *Research methods and statistics: A critical thinking approach.* New York, NY: Cengage Learning.

Shukla, D., Devi, B., & Agrawal, A. (2011). Outcome measures for traumatic brain injury. *Clinical Neurology and Neurosurgery*, *113*(6), 435-441. Retrieved from PubMed.

Smits, M., Dippel, W., & Steyerberg, W. (2007). Predicting intracranial traumatic findings on computed tomography in patients with minor head injury: The CHIP prediction rule. *Annals of Internal Medicine, 146,* 397–405. Retrieved from PubMed.

Starkstein, S., & Jorge, R. (2008). Dementia after traumatic brain injury. *InternationalPsychogeriatry, 17*, 93-107.

Staudenmayer, K., Diaz-Arrastia, R., Oliveira, A., Gentilello, L., & Shafi, S. (2007). Ethnic disparities in long-term functional outcomes after traumatic brain injury. *The Journal of Trauma: Injury, Infection, and Critical Care*, *63*(6), 1364-1369.

Stevens, M., Lovejoy, D., Jinsuh, K., Howard, O., Inam, K., & Witt, S. (2012). Multiple resting state network functional connectivity abnormalities in mild traumatic brain injury. *Brain Imaging and Behavior, 6*(2), 293-318. Retrieved from PubMed.

Stocchetti, N. (2007). Could intracranial pressure in traumatic brain injury be measured or predicted noninvasively? *Intensive Care Medicine, 33*(10), 211-220.

Tagliaferri, F., Compagnone, C., & Korsic, M. (2008). A systematic review of brain injury epidemiology in Europe. *Acta Neurochirurgica*, *148*, 255-268.

Tariot, P., Loy, R., & Ryan, J. (2009). Mood stabilizers in Alzheimer's disease: Symptomatic and neuroprotective rationales. *Advanced Drug Delivery Reviews, 54*, 1567–1577.Retrieved from PubMed.

Temkin, N., Anderson, G., Winn, H., Ellenbogen, R., Britz, G.,Schuster, J. (2007). Magnesium sulfate for neuroprotection after traumatic brain injury: A randomised controlled trial. *The Lancet Neurology*, *6*(1), 29-38. Retrieved from PubMed.

Terrio, H., Brenner, L. A., & Ivins, B. (2009). Traumatic brain injury screening: Preliminary findings in a US army brigade combat team. *Journal of Head Trauma Rehabilitation, 24*(1), 14-23. Retrieved from PubMed.

Tsuang, M.T., Bar, J.L., Stone, W.S., Faraone, S.V. (2004). Gene-environment interactions in mental disorders. *World Psychiatry, 3*, 73-83. Retrieved from PubMed.

Vakil, E. (2008). The outcome of moderate to severe traumatic brain injury (TBI) on different aspects of memory: A selective review. *Journal of Clinical Exper Neuropsychology, 27*, 977–1021. Retrieved from PubMed.

Vas, A., Chapman, S., Cook, L., Elliott, A., & Keebler, M. (2011). Higher-order reasoning training years after traumatic brain injury in adults. *Journal of Head Trauma Rehabilitation*, *26*(3), 224-239. Retrieved from PubMed.

Vassallo, J., Proctor-Weber, Z., Lebowitz, B., Curtiss, G., & Vanderploeg, R. (2007). Psychiatric risk factors for traumatic brain injury. *Brain Injury*, *21*(6), 567–573. Retrieved from PubMed.

Vogt, P., Gardner, D., & Lynne, H. (2012). *When to use what research design.* New York, NY: Guilford.

Walker, C., & Pickett, T. (2007). Motor impairment after severe traumatic brain injury: A longitudinal multicenter study. *Journal of Rehabilitation Research and Development, 44*(7), 975–982. Retrieved from PubMed.

Walker, R., Cole, E., Logan, K., & Corrigan, J. (2007). Screening substance abuse treatment clients for traumatic brain injury: Prevalence and characteristics. *Journal of Head Trauma Rehabilitation*, *22*(6), 360–367. Retrieved from PubMed.

Wang, J., Bakhadirov, K., Devous, M., Abdi, H., McCol, L. R., & Moore, C. (2008). Diffusion tensor tractography of traumat icdiffuse axonal injury. *Archives of Neurology*, *65*(5), 619-626. Retrieved from PubMed.

Warden, D. (2008). Military TBI during the Iraq and Afghanistan wars. *Journal of Head Trauma Rehabilitation, 21*, 398–402.

Winqvist, S., Luukinen, H., Jokelainen, J., Lehtilahti, M., Näyhä, S., & Hillbom, M. (2008). Recurrent traumatic brain injury is predicted by the index injury occurring

under the influence of alcohol. *Brain Injury*, *22*(10), 780-785. Retrieved from PubMed.

Wise, E., Mathews-Dalton, C., Dikmen, S., Temkin, N., Machamer, J.,Bell, K. (2010). Impact of traumatic brain injury on participation in leisure activities. *Archives of Physical Medicine and Rehabilitation*, *91*(9), 1357-1362. Retrieved from PubMed.

Zaloshnja, E., Miller, T., Langlois, J., & Selassie, A. (2008). Prevalence of long-term disability from traumatic brain injury in the civilian population of the United States. *Journal of Head Trauma Rehabilitation*, *23*(6), 394-400.

Zanier, R., Ortolano, F., Ghisoni, L., Colombo, A., & Losappio, S. (2007). Intracranial pressure monitoring in intensive care: Clinical advantages of a computerized system over manual recording. *Critical Care*, *11*(1), 125-130. Retrieved from PubMed.

Appendix A: Further Data Analyses - Correlations and Multiple Regressions

Pre-Injury/Postinjury Comparison of Productive Employment

The table below compares the pre-injury and postinjury employment status of participants. Notable changes can be observed in with regard to the percentage of participants in competitive employment before and after TBI, from 96.2% to 87.4%.

Table A1

Participants' Employment Status before and after TBI

Weeks worked past year	Prior TBI	%	After TBI	%
Full Time Student	1	0.18%	3	1.80%
Part Time Student	0	0.00%	1	0.60%
Competitively Employed	542	96.27%	146	87.43%
Taking Care of House or Family	2	0.36%	1	0.60%
Retired: Age-related	1	0.18%	1	0.60%
Unemployed: Looking	10	1.78%	9	5.39%
Retired: Disability	0	0.00%	3	1.80%
Unemployed: Not Looking	6	1.07%	3	1.80%
On Leave From Work: Not receiving pay	1	0.18%	0	0.00%
Total	563		167	

A paired-samples t-test was performed to compare hours of paid competitive employment per week and weeks worked in competitive employment during pre-injury and postinjury. For the hours of paid competitive employment per week, there was a significant difference in pre-injury hours of paid competitive employment per week ($M = 35.81$, $SD = 6.59$) and postinjury hours of paid competitive employment ($M = 24.56$, $SD = 10.74$); $t(499) = 14.329$, $p = .00$. These results suggest that traumatic brain injury has an effect on the hours of competitive paid work per week.

For weeks worked in the past year (job stability), there was a significant difference between pre-injury hours worked in the past year (M = 37.59, SD = 10.74) and postinjury hours worked per week (M = 39.68, SD = 7.72) t (499) = -3.269, p = .001). These results suggest that TBI has an effect on job stability.

Preliminary Correlations

Severity of TBI (GCS) and engagement in productive work (post injury hours per week in competitive paid work). The findings suggest an insignificant weak negative relationship (r = -0.1) between hours of paid competitive employment per week and the severity of TBI as measured using the Glasgow Coma Scale (*p >.05).*

Severity of TBI and job stability (post injury worked in the past year). The results of this study indicate that a weak negative relationship (r = -0.1) exists between severity of TBI as measured using the GCS and job stability after injury as measured by the weeks worked in the past year after injury. However, this relationship is not significant ((*p*> 0.05).

Satisfaction With Life Scale (SWLS) and engagement in productive work (hours of paid competitive work per week). The findings of this research indicate a weak positive relationship (r = 0.05) between satisfaction with life and hours of paid competitive employment per week. However, it is imperative to note that this correlation is not significant ((*p*> 0.05).

Satisfaction With Life Scale and postinjury job stability (weeks worked in competitive employment in the past year after TBI). The findings suggest that a moderate positive relationship (r = 0.5) exists between satisfaction with life and job

stability. This relationship is statistically significant (($p< 0.05$), which implies that TBI patients with high life satisfaction are more likely to have high job stability.

Participation activities and engagement in productive work (hours of competitive paid employment per week). The results indicated a weak positive relationship (r = 0.16) between participation activities and hours of paid competitive work per week after TBI. This relationship is significant, which implies that talking part in participation activities results in a slight improvement in the hours of paid competitive work after injury.

Participation Activities and Job Stability

The results reported a moderate positive relationship (r = 0.580) between taking part in participation activities and job stability. This relationship is significant, which implies that taking part in participation activities results in a moderate increase in job stability. Other correlations are shown in the table below.

Table A2

Correlations

		Weeks Worked Past Year (Follow Up Interview)	Hours Worked per Week (Follow Up Interview)	Annual Earnings (Follow Up Interview)
Weeks Worked Past Year (Follow Up Interview)	Pearson Correlation	1	.341**	.359**
	Sig. (2-tailed)		.000	.000
	N	185	168	164
Hours Worked per	Pearson	.341**	1	.485**

Week (Follow Up Interview)	Correlation Sig. (2-tailed)	.000		.000
	N	168	190	160
Annual Earnings (Follow Up Interview)	Pearson Correlation	.359**	.485**	1
	Sig. (2-tailed)	.000	.000	
	N	164	160	168

**. Correlation is significant at the 0.01 level (2-tailed).

Table A3

Correlations

		Hours Worked per Week (Follow Up Interview)	Life is Close to Ideal	Life Conditions are Excellent	Satisfied with Life	Gotten Important Things in Life	Change Nothing if Lived Life Over
Hours Worked per Week (Follow Up Interview)	Pearson Correlation	1	.021	-.003	-.018	-.009	-.035
	Sig. (2-tailed)		.788	.966	.815	.913	.657
	N	190	164	164	164	164	163
Life is Close to Ideal	Pearson Correlation	.021	1	.658**	.613**	.457**	.446**
	Sig. (2-tailed)	.788		.000	.000	.000	.000
	N	164	451	451	451	451	448
Life Conditions are Excellent	Pearson Correlation	-.003	.658**	1	.664**	.544**	.458**
	Sig. (2-tailed)	.966	.000		.000	.000	.000
	N	164	451	451	451	451	448
Satisfied with Life	Pearson Correlation	-.018	.613**	.664**	1	.571**	.507**
	Sig. (2-tailed)	.815	.000	.000		.000	.000
	N	164	451	451	451	451	448
Gotten Important Things in Life	Pearson Correlation	-.009	.457**	.544**	.571**	1	.470**
	Sig. (2-tailed)	.913	.000	.000	.000		.000
	N	164	451	451	451	451	448

Change Nothing if Lived Life Over	Pearson Correlation	-.035	.446**	.458**	.507**	.470**	1
	Sig. (2-tailed)	.657	.000	.000	.000	.000	
	N	163	448	448	448	448	448

*Note.***. Correlation is significant at the 0.01 level (2-tailed).

Table A3: correlations

Multiple Regressions

Predictors of Engagement in Productive Work After TBI. A multiple regression was performed to determine the significant factors that can be used in predicting engagement in productive work, which was the dependent variable whereas the independent variable set comprised severity of TBI measured using GCS, satisfaction with life, and participation activities. Regarding the model fit, a multiple regression coefficient of 0.501 was reported, which indicates a good prediction level. In addition, there was a good fit between the overall regression model and the data. It is evident that independent variables in the model can be used to predict the dependent variable (hours of paid competitive work after TBI with s statistical significance, $F(3, 496) = 55.422$, $p = .000$. The table below shows the estimated model coefficients for the model used in predicting engagement in productive work as measured using the hours worked per week after TBI.

Table A4

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B	
		B	Std. Error	Beta			Lower Bound	Upper Bound
1	(Constant)	13.810	2.044		6.757	.000	9.794	17.826
	Severity of TBI as	.434	.108	.222	4.034	.000	.223	.646

measured by the Glasgow Coma Scale							
Satisfaction with Life Scale	-2.907	.254	-2.453	-11.450	.000	-3.406	-2.408
Sum of participation activities	2.845	.230	2.456	12.370	.000	2.393	3.297

Note. a. Dependent Variable: Hours of Paid Competitive Employment Per Week - Post Injury
Table A5: Regression statistics for predictors of productive employment after TBI

The model used in predicting engagement in productive work from severity of TBI, satisfaction with life and participation activities is shown by the equation below:

$$ProdWork = 13.810 + 0.434SevTBI - 2.907SWL + 2.845Part$$

Whereby *ProdWork* is engagement in productive work measured using hours of paid competitive work per week after TBI;

SevTBI is the severity of TBI measured using the GCS;

SWL is satisfaction with life summed from the individual items in the satisfaction with life scale;

Part is sum of the various participation activities.

Overall, a multiple regression was performed to predict engagement in productive work from severity of TBI, satisfaction with life and participation activities. All the three variables statistically significantly predicted engagement in productive work, F (3, 496) = 55.422, p <.05, R^2 = .251.

Predictors of Job Stability After TBI. A multiple regression was performed to determine the significant factors that can be used in predicting job stability after TBI, which was the dependent variable whereas the independent variable set comprised severity of TBI measured using GCS, satisfaction with life, and participation activities. Regarding the model fit, a multiple regression coefficient of R = 0.731 was reported,

which indicates a good prediction level. In addition, there was a good fit between the overall regression model and the data. It is evident that independent variables in the model can be used to predict the dependent variable (hours of paid competitive work after TBI with statistical significance, F (3, 496) = 189.319, p = .000. The table below shows the estimated model coefficients for the model used in predicting engagement in productive work as measured using the hours worked per week after TBI.

Table A5

Regression Statistics

Model		Coefficients				
		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	6.157	1.887		3.263	.001
	Severity of TBI as measured by the Glasgow Coma Scale	-.245	.099	-.107	-2.460	.014
	Satisfaction with Life Scale	-2.216	.234	-1.598	-9.454	.000
	Sum of Participation Activities	2.950	.212	2.177	13.896	.000

a. Dependent Variable: Weeks Worked in Past Year in Competitive Employment - Post Injury

The model used in predicting job stability from severity of TBI, satisfaction with life and participation activities is shown by the equation below:

$$JobStab = 6.157 - 2.45\,SevTbI - 2.216SWL + 2.950Part$$

Whereby *ProdWork* is engagement in productive work measured using hours of paid competitive work per week after TBI;

SevTBI is the severity of TBI measured using the GCS;

SWL is satisfaction with life summed from the individual items in the satisfaction with life scale;

Part is sum of the various participation activities.

Overall, a multiple regression was performed to predict job stability from severity of TBI, satisfaction with life and participation activities. All the three variables statistically significantly predicted engagement in productive work, F (3, 496) = 189.319, p = .000, R^2 = .534.